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THE HEALTHY GIRL

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THE
HEALTHY GIRL

BY

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PREFACE

THIS book is an attempt to help the girl who is leaving school and learning to face life, to understand the most important circumstance she is likely to encounter—herself.

The later chapters deal with school life; and it is hoped they may be found useful by mothers and teachers.

We are constantly asked many of the questions which we have here tried to answer, and shall be grateful for criticism which may correct us where we are mistaken and supply what is lacking.

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THE HEALTHY GIRL

CHAPTER I.

MIND AND BODY.

"My business is not to remake myself, but make the absolute best of what God made."

ALL women, whether they will or not, must deal with girls. In the first instance we have to make ourselves, and later on we are fairly certain to have to help to make other girls, either our own or someone else's.

Now, in all making we have two things to consider: first, the material given us to work on, and secondly, what we mean to do with it; and perhaps why we fail so often in our own lives, and in helping other people, is because we blunder ahead with very little idea of the stuff we are working on, or the end to be attained with it. So we set to work, planning and scheming impossible things, because the material is altogether unsuited to our plans.

For this material differs from all others in this, that it is alive, and at any minute may turn round and say, "I won't." It always amuses me to watch children growing beans for the first time. They are so injured when the plants "won't work," and they cannot make them. Just because they are alive, their individuality may upset all previous calculations, and you must consider not only the conditions, but how those conditions affect the particular plant with which you are dealing. In the very same way *no two* girls are alike, and you may get different results from the same treatment.

Now, the understanding of varying individuality cannot be taught. The all-important factor in dealing with girls, or with yourself, is sympathy, but it is a very great deal easier to sympathize wisely in any special case, where you understand something of the general rules which govern conduct, than where you do not. First, then, let us try to get some idea of the *stuff* with which we have to do.

Every girl is at least two-sided. She consists, as we know her, of a mind and a body, through which she expresses her thoughts, and these two are so closely related that causes which affect the one inevitably affect the other also. An unhappy child loses weight. An anæmic child kept in dark, dull places grows listless and don't-care. A little girl in the tropics was sent up to the hills; it was "so much healthier and better for her!" but the curious thing was that, instead of getting stronger, she grew thinner, and didn't want to eat; and after a fair trial the experiment was given up; the child was unhappy, and her unhappiness was worse for her body than the heat of the plains. Of course, you may say she should have been helped to conquer her unhappiness, and that is very true, but the fact remains that an unhappy child loses weight—her mental trouble causes bodily ones. On the other hand, an anæmic child becomes listless and don't-care, because a change which began in her body has affected her mind.

We must believe, then, that for every mental process there is a corresponding bodily one, and the bodily one consists in changes in the nervous system.

The nervous system consists of brain and spinal cord, from which nerves are sent out to every part of the body; these nerves look like small, soft white threads, and consist of a number of fine fibres, by means of which communication is kept open between the world around us, and the brain. Sensory fibres convey messages *to* the brain, which result in our feeling. Motor fibres bring down messages *from* the brain to muscles, bidding them contract or relax. For example, I take hold of a hot teapot handle; the sensory nerve fibres in my hand carry up to the brain a message that "it burns," the motor nerve fibre carries down a message to the hand muscles, telling them to contract and move the hand away; if the sensory nerves be cut through or diseased, I shall not feel the burn, but will continue to hold my hand on the handle though it blister the skin; if the motor nerve fibres are cut or diseased, I shall feel the burning, but be unable to move my hand off for myself —the muscles have received no message. Again, the brain itself may be at fault. If the nerve cells of the brain are poisoned by chloroform, as, for example, when a person is undergoing an operation, the feet may be badly burned by too hot water bottles, for messages are not duly transmitted.

Our nervous system is the supreme governor of the body; no movement can take place, no feeling be experienced, independently of it. A knock on the head or an overdose of alcohol may make a man dead or a stranger to his fellows. Whatever the ultimate

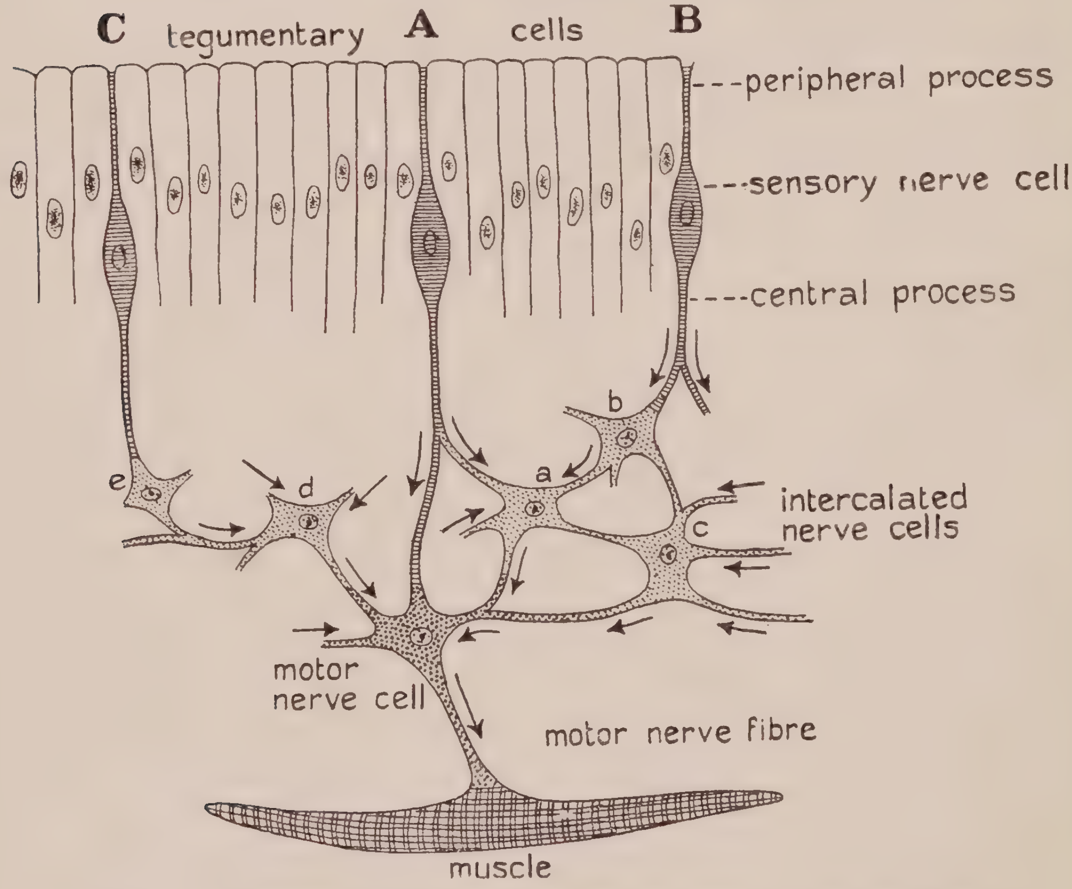

Fig. 1.—Diagram to illustrate how nerves pass from sense organs to muscles. The "tegumentary" cells cover the various parts of the body; the "peripheral processes" are branches which run from the nerve cell towards the surface. The arrows show the direction in which a message passes from the sensory nerve cell to the central ("intercalated") nerve cells; it finally reaches the motor nerve fibre which is in connection with a muscle.

relations of mind and body, it is clear that in this life we must aim at a sound nervous system if we would be of use in the world.

Now the body is a very good servant, a very bad master. All our happiness may depend on our understanding how to use it. If we abuse it through ignorance or self-will, it will turn on us and give us a very bad time. The hardest thing we can learn, or help other people to learn, is self-control, and we often make it a great deal harder because we will not recognize a physical state which is influencing our mental state, or sometimes even when we do recognize it we neglect to go a step further and seek the remedy. "Sally," I said to a girl one day, who had been persistently and ostentatiously yawning, "you mustn't yawn like that; it is rude." "I can't help it," she answered, "it's my nerves;" and when I told her she must learn to manage her nerves, not let them manage her, she opened her eyes wide, and exclaimed, "Why, that's just what the doctor says!" In the same way a girl says, "Oh, So-and-so gets on my nerves," as a sort of excuse for all kinds of wrong-doing, and there she leaves the matter, apparently satisfied.

In such cases it is no use indulging the "nerves." Both girls are speaking the truth—it *is* a faulty nervous system that is making one girl self-conscious, another irritable; but, having recognized that fact, the next thing is to get the nervous system into order. They have not found an excuse for their want of self-control, but a physical failing which must be put right, and, since nerves are material things, they are often best treated by material means. I have so often seen mothers and schoolmistresses trying to correct faults in girls by "influence," and "talking," when something is really at fault in the child's body. If we would only treat body with mind, we would not so often demand impossibilities for ourselves and other people. Very many faults in character can be directly traced to a faulty nervous system, and we are far wiser to go for the causes of this first. The soundness of the nervous system will depend very largely on two factors, a just balance between rest and activity, and good food (*i.e.*, the blood which supplies the nerves should contain what they require, and nothing poisonous).

Rest and activity.—Sleep and exercise are big subjects, demanding a chapter each. It may be said, however, that when nervous trouble exists we should make sure that we are not overdoing things. We may be getting too little sleep, or we may be giving ourselves too little quiet. Girls and women are apt to rush off to one another to "talk things over," when what they really need is to be quiet and alone. One pitifully excitable girl who was in my form, and a difficulty both to herself and to other people, I asked to help me in the science room, and whenever she was finding things very difficult, we had no argument or discussion, but there was a lot of washing up to do! Gardening, mending, drawing, are all helpful in the same way, for rest from nerve tension need not mean idleness. A girl who is worried or overworked will often be able to rest far better by using her hands and doing a bit of useful work quietly, than by doing nothing. I have come across girls whose only idea of rest from excitement is to lie down all afternoon with a novel! These people are apt to suffer from having *too little to do* that is of any real use to anyone. Every girl *needs* a hobby which will occupy her hands and give her brain a rest.

Good food and fresh air, on which the blood supply depends, also demand a chapter each. When poisons circulate in the blood, the nerves which depend on that blood for their food must suffer, and we must never forget that impure air means slow poisoning as surely as indigestion. Where there is a lack of food the nerves will be starved. All brain work is largely dependent on cooks!

If then you have decided that you are doing your best for the nervous system by giving it plenty of quiet and sleep and wholesome occupation, you must still make sure that you are not sparing in food and fresh air. Health can colour and limit the whole outlook. Dyspeptic girls are those who have forgotten to clean their window-panes, and their view of things is apt to be gloomy. Anæmic girls have forgotten to pull up the blind; they are always sleepy. Girls with a crooked spine are apt to see things crooked, for the glass of their window-pane is roughened, and distorts their vision.

Bearing these things in mind, we can now consider what are the faults which we can best tackle by trying to help the nervous system.

Constant crying always means want of nervous control; its most common cause in older girls is overwork, or that more frequent source of breakdown in students—"money worry." "I never knew I was overworking," said a young girl-student working for her B.Sc. examination, "till one day I burst out crying for no reason at all." There is only one remedy—release the nervous tension by slacking off work, and build up more physical strength by an *open-air life* and *plenty of good food.* In younger girls crying may be due to shyness or some physical difficulty they are afraid to speak of. The cause of a little girl's tears should always be tactfully sought; then she should be encouraged to try to help herself. If you have seen that she is living under proper conditions, she can begin to try to stop what has become a bad habit. I knew one little motherless girl who came to school, and cried whenever she was spoken to. We talked it over, and decided it really did nobody any good; then we made a compact that she should make a big effort not to cry for a day, and count the times she did, and let me know. She found that after all she could stop, and by degrees she became like other children. But this moral suasion would be of little use till the child was well enough to control herself.

Irritability is all a matter of nerves. Some girls suffer from almost overmastering irritability at their monthly period, or just before it. If they know that it is due to this, it helps them. Forewarned is forearmed, and if they get up in the morning knowing "I am likely to be cross to-day," they are well on the road to getting over the crossness, for they know that the blame when things go wrong will be largely due to themselves and not to those around them.

Continuous wrong diet may cause irritability. A small boy was so afflicted by bad temper that people shook their heads and spoke of heredity; he always woke up on the wrong side, as cross as two sticks, and his nurse suggested he had better have no sleep in the daytime! Luckily for him, he went to stay with cousins who were never given new bread. The bad temper vanished—the whole trouble had been caused by a diet of fresh bread. "Of course," you will say, "everybody knows that!" But I know of a school where the girls have hot rolls and no choice for breakfast every Monday morning!

Spinal curvature brings with it an irritable temper—so much so that a doctor has been known to say that a crooked spine and a nagging wife invariably go together. This trouble is extraordinarily common among girls between 12 and 16, and if not attended to then, it becomes permanent. In our school of 130 we have this year 29 more or less crooked backs.

Indecision is often a sign of brain-fag. When a girl of determined character hesitates, and does not know her own mind even in trivial things, her nerves want help. We have all felt that it is difficult to choose and judge and decide, when we are overtired.

Apparent carelessness and clumsiness may be due to defective eyesight.[1] A child who cannot see the edge of a cup clearly will constantly spill. Dropping things is a symptom of chorea or St. Vitus's dance, but of course it may be a bad habit.

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[1] Kipling's story, *Baa, Baa, Black Sheep,* is an excellent illustration of this.

Grimaces may be caused by cracked lips. A child keeps stretching her mouth to see how the lip is. On the other hand, they are often a symptom of nervous weakness or St. Vitus's dance.

Stupidity may be due to defective eyesight, and where a girl has always been short-sighted she will have no idea that she only half sees things. Unless someone finds out for her where her difficulty lies, she will go to the end of her life seeing things in a haze. On the other hand, many a so-called stupid girl is really deaf. She does not quite catch what is said, and gets muddled. This deafness may be due to adenoids, *i.e.* growths between nose and throat which obstruct the air-passages. If you look at a stupid child you often notice the way he holds his mouth open, and that vacant look and stuffy voice probably indicate mouth breathing. The usual causes of nerve trouble—exhaustion, poor food, stuffy rooms—may be affecting your "stupid," otherwise mismanaged, girl. An anæmic, *i.e.* bloodless, girl is of necessity dull, for if there is not enough blood to feed the brain, it cannot work. If you have brains yourself, make *very* sure that your stupid child is not suffering because *you* are too stupid to get at the cause of her stupidity.

Sulkiness is closely allied with stupidity. Constipation, perhaps, is as large a factor in causing it as any other.

Morbid depression, where all seems wrong and nothing seems right, sometimes gives girls of college age a great deal of trouble. It is a matter of nerves. Anæmia, sleeplessness, and reaction after over-excitement will all help to cause it, and it must be fought as any other nerve trouble by seeking for physical causes. In many cases it is directly traceable to faulty digestion.

Untruthfulness.—Little children are often what older people call untruthful, largely because they have not learnt to know the difference between what they imagine and what happens. A little girl of four will romance delightfully. In older girls this romancing becomes a very real difficulty. Sometimes it is connected with some bad habit, or the reading of bad books, sometimes with hysteria, but, in any case, if a girl is persistently untruthful it is well to consult the doctor, and the same holds good about theft.

In every case a fault must be dealt with at once before it becomes a habit. Whenever, then, we find ourselves or others having real difficulty with these faults, we must give the body a chance. Take plenty of sleep, have plenty to do, but *go slowly* if you are getting fussed. Be out as much as you can, and see that the bottom of all your troubles is not indigestion or, more likely, constipation. Our body is the only instrument we possess through which our minds may express themselves, and that instrument must be kept clean and fit for use.

Kept clean and fit for use, I say. Ah yes, but to do this we must have self-control. That is, our mind must be as clean and fit for use as the body which expresses it. For if it is true that faults may be due to physical causes, it is no less true that a great deal of our physical health depends upon our state of mind.

A girl is overdone, and thoroughly irritable. She knows she has a long day's work, and she gets up in the morning as tired as she went to bed. In the end she goes to a doctor, who at once says, "Nine hours' sleep." "What," says the girl, "go to bed at nine o'clock when I've so little time to talk and enjoy myself." "Oh yes," says the doctor, "it's *very* hard lines, but you'll break down if you don't." "Well, I'll try," and she does try—for a night or two—but there is that pleasant chat with a friend, or that interesting book to finish, so the clock slips on night after night, and the nervous energy falls lower and lower, and when the inevitable breakdown comes, the hard work is blamed, or the home worries—too seldom her own weak will. "People talk as if free will meant being able to do what you like," Miss Beale used to tell her students. "It is not that at all; it is to be able to do what you don't like!"

The very worst thing for mind and body is constant harping upon self. Of course, if you deliberately undertake more work than you can do, or go without enough food, you will have no right to sit down and wonder why everything goes wrong. There are certain so-called unselfish people who are always overdone and always a cause of anxiety to their friends, because they refuse to recognize their limitations. We shall not make the absolute best of what God made if we persist in abusing the stuff He gave us, *i.e.* our bodies, but we must not forget that physical health must never be treated as an end in itself. It is the means by which we may be enabled to do more useful work. There is a real danger at present lest in our anxiety to improve the physical well-being of the nation we lose sight of the aim, *i.e.* the improvement of the *character* of the nation. I am convinced that all health teaching should rest upon a religious basis. Many bodily troubles may be due to "taints of blood," but others are as surely the effects of "sins of will." We must see to it that we are living under fair conditions, and then that our main interests are not self-centred. No duty which is clearly a duty is ever impossible, and we can always do what is right. Dr. Clouston, in his *Mental Hygiene,* lays great stress on this religious basis in the teaching of boys. It is equally needed for girls. "Seventy-five per cent. of education," says a great preacher, "consists in learning either in physical or mental life that we are to *face* risks, not shun them, and that so faced they are the conditions of a richer and happier life."[1]

And another great advantage of religious training is that it enables a girl to live in the atmosphere of faith, not fear. I wonder how many people have been saved from nervous breakdown because they have learned to shoulder to-day's burdens only. For all girls the future must loom up, vast, mysterious. They look forward, not back, and they have little experience to guide them, and great self-confidence, with occasional terrible moments of weakness and helplessness. There is a mountain of work for an examination, so big a mountain it seems, that the girl is appalled—and she worries and frets, and perhaps breaks down, and no one has ever told her that if she will take it a step at a time, doing the day's work as it comes, she will get to the top all right. Or there is money anxiety in the home, and there is a possibility that she may not be able to go to college. The money comes, and she goes to college, and breaks down at once, worn out with the strain of worrying about what never happened. Don't put up your umbrella before it begins to rain. Care for others, courage, and confidence in the righteousness at the heart of all things; these gifts are not ours to give, but we may see to it that we put girls where they can gain them for themselves. Body and mind may be, as some philosophers say, two sides of a shield —at best we only know them as parts of a whole— both to be fairly dealt by and duly controlled.

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[1] Figgis, *The Gospel of Human Needs.*

"Let us not always say,
'Spite of this flesh to-day
I strove, made head, gained ground upon the whole!'
As the bird wings and sings,
Let us say, 'All good things
Are ours, nor soul helps flesh more, now, than flesh helps soul.'"

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CHAPTER II.

WORK AND REST.

NERVES.

I HAVE tried to show how important it is that the nervous system should be kept in good working order, that this will depend largely upon a due balance between rest and activity.

If we examine the nerve stuff of which the brain, spinal cord, and the nerves which come from them are built up, we find that it is a soft grey and white substance. The grey part consists of masses of tiny specks of living matter or cells, the white of long fibres, numbers of which are bound together to form "nerves."

The nerve cells are all present at birth, but are simply little round masses which must become more complicated as the child grows up. As they develop they send out branches or processes by means of which messages can be sent from cell to cell or down the fibres. They also develop a substance in which all nervous energy is stored. Whenever the cell works, this energy is used and then rest is needed till the cell has had time to manufacture it afresh. If the growing nerve cell is forced to go on working when its store is exhausted it can only do so at the expense of its own living substance, and may be permanently damaged.

From the age of 12 to 25 the nerve cells are developing exceedingly rapidly, and numbers of them are forming connecting branches and learning to work for the first time. The connections by which in later life one group of cells can send messages to restrain over-activity in another are only being formed, and so we get lack of balance, excitement, crying, etc., because the physical basis of self-control (*i.e.* right connections between the different centres of nervous activity) is more or less wanting. The girl acts on impulse, for she cannot connect, and for the same reason she is persistently late and forgetful. The newly working cells have yet little nervous energy to draw upon, and over-pressure may end in permanently damaging them. On the other hand, things grow in the using, and too little work may mean under-development. The first danger is far the greater under present conditions. A master in a big secondary school said to me lately, "I cannot understand how it is children come here quite bright and grow stupid." Of course, they grow stupid if they are drawing on a bankrupt

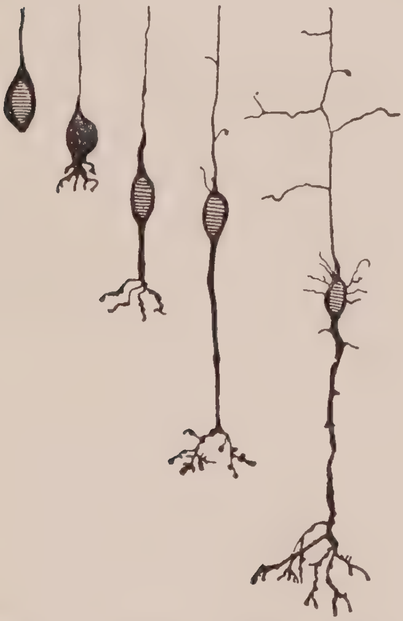

FIG. 2.—Nerve cells, showing how the branching processes develop.

nervous stock. More than one girl has told me at the very beginning of her life, "I am *sick* of work." She has tried to take examinations too fast, and the best way for her to get keen again is to go off and idle till those nerve cells she has been abusing have had time to recover.

Since rest is essential for the production of nervous energy, girls must have plenty of it. It may, however, be in one of two forms—change of occupation and sleep.

Where a girl has been using any group of nerve cells for a time, those cells will be tired, but it does not follow that the rest of her is. School time tables are all drawn up in accordance with this principle, and it is quite impossible to lay down hard-and-fast rules. It has been well said that there is no generalization in education except that you cannot generalize.[1] What we need is heads of schools who are neither sunk in officialdom nor faddists, who themselves teach and have in this way kept in touch with the girl as she really is, and who then have sufficient capacity to settle on a curriculum suited to their own school, to the classes in that school, and finally to the individual girls in each class. When we leave school perhaps we have to make our own time table for each day, but the same principles will still obtain.

Lessons which need much concentration, like Mathematics, should come early in the day, and it is a great mistake to think that subjects such as Drawing involve little effort; until hand work becomes mechanical, it demands a very great deal of concentration, if it is to be well done. For instance, a needlework class in which girls are hemming or doing other well-known stitches is really restful to the thinking-centres in the brain, but when the same class are cutting out or doing embroidery, which involve learning quite new stitches, they are using brain as well as hands. Lessons in which girls are constantly talked to should alternate with quiet ones.

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[1] See an excellent paper by Miss Geraldine Hodgson on *The Primrose Path.* It can be obtained from the secretary of University Women Teachers, 57 Cambridge Street, W.

Working hours should be short, and during that time there should be absolute concentration; if the hours are too long, the girls fall into a habit of half working in self-defence, or with an enthusiastic teacher they are overdone. In one boarding-school I tried, as an experiment, cutting the work down to a minimum, about six hours a day, but during those six hours there was no question of talking or idling. The girls themselves were dubious, especially the elder ones, who had been used to hanging about book in hand. At the end of a year, examination results proved that at least in that respect the policy had succeeded. In the case of factory hands shorter hours would probably lead to a greater output of work. An Australian who came over a year or two since was struck by the little work done in so much time; but, of course, this is not at all conclusive, as girls in Australia had better food as well as shorter time to account for the extra work done. A quick girl should work fewer hours than a slow one, and six to seven hours' lesson-work, including practice, is the outside maximum for growing girls; many are better with less. Disorderly talking and interruption during lessons all mean additional nerve strain, for it requires more energy to start a machine than to keep it going. I have found in practice that girls are both happier and do much better work where a strict line is drawn between work and playtime; muddle, indecision, and constant chatter do not rest but exhaust.

It pays to give older girls a complete break for a few minutes after about an hour's work, whether lessons or preparation. Up to 14 or 15 three-quarters of an hour's concentration is enough. Shorter periods are bad for the same reason as interruptions, they mean that you are always getting up steam. Of course everyone should make her own experiments, for the time will vary with different people.[1] Girls must learn to go for their work with might and main, especially if they dislike it; but when they feel that they are stodged, it is far better to *leave it*, run out of doors for a few minutes, breathe deep, and forget about it. I have noticed the way in which boys and girls will go on with home lessons all evening in a hot room till they are thoroughly tired and bored: they had much better have a real break in the middle. Sunday should be as different as possible from week-days; the more complete the change from the rest of the week, the better the chances for work.

No change of occupation can take the place of sleep, and as young brain-cells recover more slowly than mature ones, all growing girls need a great deal. Mothers and school-mistresses constantly complain that girls of 16 to 20 are "so sleepy in the morning, and won't get up." This is often due to constipation, a stuffy room,[1] or anæmia; but if these things are all right, the girl had much better go to bed very early and get her sleep. Nine hours is a fair allowance for a girl from 16 to 18, but in many cases, where she is nervous and active-brained, ten is better; and by this I mean time given to *sleeping*, not to undressing or going to sleep. As term wears on schoolgirls get sleepier and sleepier, and it is as well to knock off some home-work and send them to bed half an hour sooner. Where the rising hour is at 7 the children under 10 should go to bed at 7; those between 10 and 14 at 7.30; from 14 to 16 at 8, and older girls at 9. There must always be an interval between lessons and bed, otherwise the nerve cells will be still working hard, and in the absence of anything else to think about, may go on doing so. A child who lies awake is probably over-strained. Her nerve cells are over-excited and refuse to stop work. No one can learn too young that the night is for *rest*, and they must leave all the day's concerns behind them. The girl who has learnt this has formed a habit which will stand her in good stead all her life; the other, who uses this time to say over lessons and go through the day's concerns, is laying up a bushel of trouble for the years of stress and strain. In the tropics, the evening and early morning are often so much the nicest parts of the day, that it is better to get up early and allow a quiet time for sleep during the midday heat.

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[1] Very interesting experiments on these lines are at present being carried out at Birkbeck College.

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[1] People who sleep out of doors are said to wake up quite fresh after fewer hours' sleep than they need in the house. This is explained by the fact that oxidation goes on more rapidly, and the products of fatigue are in consequence more quickly removed.

Sleeplessness in girls should always be considered as serious, and where it is due to nerve strain the cause must be got at. Some doctors are apt to say at once "overwork," meaning too many lessons; very often it is not this at all, but worry at home, poverty, the fear of what may happen, "not getting on" with others, or the stress of examinations for which the girl is really unfitted. In many cases the lessons which take her out of herself and make her forget the worry are a blessing. On the other hand, where girls are habitually working beyond their limit they are tired out and unfit to meet any additional strain. A thorough change is often the best cure, and plenty of things which are *not* worrying to think about. Where sleeplessness is due to a really great sorrow we have all to learn that we can help ourselves by taking proper food and fresh air and by getting things to do for other people. "Those who bring sunshine into the lives of others cannot keep it from themselves."

Where there is nothing to "worry" about, sleeplessness must be due to other things. A heavy supper just before bedtime will cause the blood to go to the stomach, and so prevent sleep; on the other hand, a glass of hot milk at bedtime may help a person to sleep by diverting some blood from the brain, but not too much. Cold feet and sleeplessness go together, and a hot-water bottle makes all the difference. Some people will lie awake half the night rather than take the trouble to take off or put on a blanket, or change the height of their pillows!

Sleep walking and talking may be signs of nerve strain, but are often results of indigestion. A good tea and no late meal may stop them, and a quick cold sponge and rub down last thing at night sometimes helps.

Night terrors have often been due in the first instance to reading about "horrors"; children will endure misery in this way without speaking of it. The great thing is to try to stop the habit at the beginning by giving a night light or letting the child call someone. If it is formed it may last for years, and cause needless suffering. Light and company are the only things to allay this terror, and as a girl gets older she must learn that the fear is a part of herself, and a thing to be overcome. The extent to which she can do this will depend largely on general health and religious training. Any sudden fright may cause the night-terror habit. When I was in South Africa, a native got into the children's dormitory one night. Luckily there was a trained nurse in charge; she gave them a dose of bromide all round, with the result that next morning, after a good night's rest, the whole thing was an adventure. Had they lain awake, shivering and talking about it, the effects, for some, might have been disastrous. I have kept children who have seen what they should not, preposterously busy, in the hope that by crowding in other mental impressions the bad one might be blurred, if not altogether crowded out. Entire change of scene is often the only remedy when an impression has made too deep a mark.

To sum up: both work and rest are needed for healthy nervous development. During adolescence (*i.e.* from 12 to 25) permanent damage may result from over-pressure.

Rest may take the form of change of occupation (where fresh groups of nerve cells are set to work) or of sleep—no amount of change can take the place of the latter.

Sleep troubles are usually associated with nervous overstrain, or indigestion, or imperfect circulation, or insufficient bedclothes.

CHAPTER III.

DIGESTION AND INDIGESTION.

Anatomy and Physiology.—The digestive canal is a tube which opens at one end by the mouth, at the other by the anus, from which solid rejected matter can be passed out of the body. Connected with the tube are the glands which secrete the necessary ferments for digestion of foods.

The food passes first into the mouth. The floor of the mouth is formed by the lower jaw with the tongue attached. The roof is somewhat complicated: first comes the hard then the soft palate, from which hangs a small pointed body, the uvula; behind this are the openings of the canals leading to the nose. Most of us know the unpleasant results of laughing and drinking at once, when the liquid comes back through the nostrils.

When the food has been well chewed by the teeth it is ready to be acted on by the saliva or fermenting juice poured out by three pairs of glands, each of which opens into the mouth by a narrow duct. Before food can pass into the blood stream and so be of use to the body, it must be liquid. Now a great part of our food consists of starch, which will not as such dissolve. Saliva causes the starch particles to unite with water particles, and from this union sugar results. *In short, in the mouth insoluble starch is changed into soluble sugar.*

The tongue now rolls the food into a ball; the opening leading into the windpipe is closed, and the food passed over it and down the narrow gullet or œsophagus leading to the stomach—occasionally a particle "goes the wrong way" if the windpipe be imperfectly closed, and choking results until the particle is coughed up again. From now onward the digestive canal consists of a tube expanding in places, but always with thick muscular walls—by which the food is churned about and forced along. This tube has a mucous membrane lining from which ooze the necessary juices, and through which the digested food passes to be absorbed by tiny lymphatic and blood vessels.

The distance from the teeth to the stomach is about seventeen inches, and it takes the food about six seconds to pass down. If you swallow something that is too hot you can easily count those six seconds!

The stomach is a bag which can hold from one to two pints. Meat and other proteids, *i.e.* nitrogen-containing foods, enter it unchanged, except for the grinding bestowed on them by the teeth, and where this grinding has been incomplete, and the meat is still in lumps, digestion is slow and difficult, for the juices can get at the inside of the lumps only when they have dissolved away the outside.

All proteids are insoluble, and pass with difficulty through a membrane. The stomach pours out gastric juice upon them, and the pepsin in this turns the proteid into an easily dissolved peptone; it has no effect on starchy food and fats. Digestion in the stomach takes from one to four hours according to the nature of the proteid eaten; for instance, fish and mutton take less time than beef.

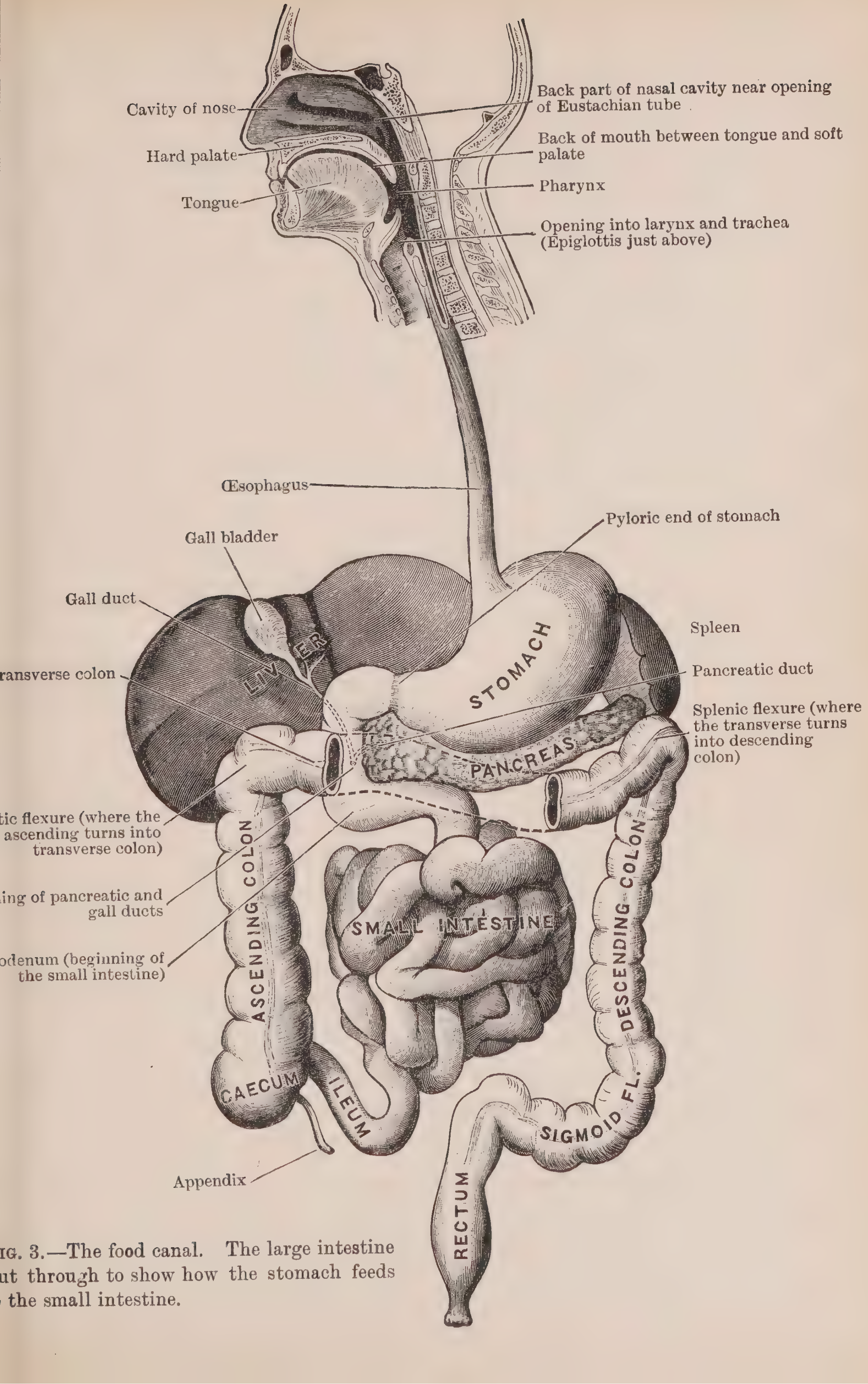
The food which has not been digested, *i.e.* absorbed by the walls of the stomach, now consists of a greyish semi-liquid mass containing all the fat eaten in an unchanged state, together with a certain amount of undigested starch and proteid. It passes from the stomach into the first loop of the duodenum; into this loop are poured the pancreatic juice from the sweet-bread—a long gland lying just below the stomach—and the bile from the liver.

The pancreatic juice has been well described as the "maid of all work," for it turns starch into sugar, proteids into peptones, and emulsifies fats by breaking them up into very small globules.

The bile emulsifies fat, and stimulates the small intestine, *i.e.* has a purgative effect.

The whole of the available food has now been liquefied, and is ready to be absorbed. What is left in solid form is "indigestible" and of no use to the body. As the liquid passes along the small intestine, the main part is absorbed by the small blood vessels, and the fat is taken up by lacteals which finally unite into a thoracic duct, and pour their contents into the blood of the jugular vein.

The indigestible particles pass into the large intestine;


Cavity of nose
Hard palate
Tongue
Back part of nasal cavity near opening of Eustachian tube
Back of mouth between tongue and soft palate
Pharynx
Opening into larynx and trachea (Epiglottis just above)
Œsophagus
Pyloric end of stomach
Gall bladder
Gall duct
LIVER
STOMACH
Spleen
ransverse colon
Pancreatic duct
Splenic flexure (where the transverse turns into descending colon)
PANCREAS
tic flexure (where the ascending turns into transverse colon)
ASCENDING COLON
DESCENDING COLON
ing of pancreatic and gall ducts
SMALL INTESTINE
odenum (beginning of the small intestine)
CAECUM
ILEUM
SIGMOID FL.
Appendix
RECTUM

IG. 3.—The food canal. The large intestine ut through to show how the stomach feeds the small intestine.

water is absorbed from them so that they tend to form a solid mass, and this passes into the rectum and out by the anus. The latter is surrounded by a strong ring-shaped muscle which is—to a certain extent—under the control of the will.

From the above account it is evident that if we want to keep ourselves and the people we keep house for well, we must pay some attention to the food question. Their food must be such that all the organs are given a fair share of work, and none overstrained, and it must contain those elements needed to repair waste and supply energy.

Food stuffs are generally classed as

Fats.
Proteids.
Carbohydrates, *i.e.* starches or sugars.

Fats—including, of course, the animal and vegetable oils—are especially heat-giving, and therefore valuable in cold climates and in winter. Thin people suffer far more from cold than fat ones, and it is most important that children should not only be more warmly clad, but should also have access to ample fatty food in winter. Milk, butter, cream, dripping, fat bacon, and cod-liver oil are all valuable cold-weather foods. On the other hand, many children digest fat with difficulty, and where they have an intense dislike to it in one form, another must be tried. To force a child to eat what it loathes is not only cruel but unwise. Find out in what form she can take it without feeling sick, and later on try the other forms again.

Proteids, or nitrogen-containing foods, are essential for building up the tissues of the body, as nitrogen is present in the living substance or protoplasm. All work implies the breaking down or wasting of these tissues, and fresh food and oxygen must be supplied if they are to be built up again ready for more work. Meat—including of course fish, fowl, and eggs—supplies proteids in the most digestible form, but they are also present in small quantities in most vegetable foods; peas, beans, and lentils are a cheap source of proteid supply, but are *not* easily digested.

Carbohydrates—the starches and sugars—are essentially energy-supplying; that is to say, when they unite with the oxygen which we breathe in, energy is set free and enables us to work.[1] Bread, potatoes, and all sweet foods come under this heading.

A perfect diet, then, will supply these foods in such proportion that a girl suffers from no undue strain on any one digestive organ, has plenty of energy for work and play, and is building tissues fast enough, not only to make up for waste but to grow. You *must* have fat, sugar, and proteid, and they must be properly balanced. Cooks found this out long ago when they gave us milk with porridge, butter with bread, and bacon with veal.

The day's digestion.—No serious work should be done before breakfast. Last night's supper has been digested, and though it is quite possible to work on one's food reserve, it is more economical to stoke up afresh.

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[1] See also "Breathing."

Every healthy growing girl should be hungry for breakfast, for the stomach has had a long rest and should be ready for work. Where this is not the case, the sleeping-room may be stuffy, or the supper indigestible, or the girl may be constipated. In any case, a person who does not eat well in the morning is not in perfect health.

For all growing girls, breakfast should be a substantial meal, with plenty of time allowed for it. Porridge and milk is excellent, with syrup or sugar. Bread and milk is nice, but indigestible, as the starchy bread should be in the mouth long enough for the saliva to act on it, instead of just slipping down. Eggs, fish, and bacon are desirable where funds permit, and may be followed by bread and butter or dripping, and some sweet stuff, marmalade, jam, or syrup. Hot milk and cocoa made with milk are better beverages than tea or coffee.

It is a very bad plan to get up late and have to rush straight from breakfast to work; far better put the meal twenty minutes earlier. A great deal of constipation is due to this rush, where girls either forget or have no time. I knew a family of girls who went to a large and well-known school where this rush occurred. They are now all bothered by constipation, which varies in its obstinacy according to the number of years they were at school. The one who was there longest also has appendicitis.

The midday meal should be substantial and appetizing, and as far as possible it should fit the weather. I well remember in South Africa trailing home in the burning sun, making up menus of what we should like to eat, and finding on our arrival hot meat and boiled suet pudding! *Our* menu was so much more common sense!

Roast meat is more nutritious than boiled, as the outside becomes hardened before the meat juices have time to escape.

Meat fried at too high a temperature is apt to be hard and indigestible.

In stews, all the juices of the meat are to some extent preserved in the gravy. Twice cooked meat is indigestible, for each cooking hardens the fibres.

Milky milk-pudding and fruit are best for girls who are going to play games soon after dinner, as they are quickly digested. Milk puddings are much improved by the addition of a little suet or dripping. A cookery teacher tells me she regularly adopts this device, as she cannot get the girls—many from poor homes—to eat fat in other forms.

Light suet puddings are very nourishing, but they take a long time to digest, and few people can do good brain-work, or play hard, soon after eating them. *Light* pastry is nourishing. It is often better economy to throw away heavy puddings than to eat them. The reason why they are indigestible is obvious: in a light pudding the particles fall apart easily and can be acted on by the digestive juices; in a heavy one they are glued together!

Plenty of sugar should be allowed with pudding Many girls have a real craving for it, and this is better satisfied. Sugar is especially valuable for girls who dislike fat.

Vegetables should form a very important part of every dinner. They supply the fresh element so wanting in diet, for freshness of food is not a luxury but a necessity. We know now that babies fed on sterilised or boiled milk fall ill with a form of scurvy exactly as sailors did, in the olden days of long voyages with no fresh food. Fruit also is most valuable, and wherever it is possible to afford it, girls should be allowed it, either at midday, in the morning, or after dinner; bananas, oranges, apples, figs, and green grapes, if bought in quantities at the right places, are not too costly when in season.

Simple sauces and good serving make a great difference to the appetite. They increase the flow of digestive juice, and so make digestion easier. We all know how our mouths water at the prospect of "something nice." Sauces are best, however, when they are themselves *foods,* not condiments; *e.g.*, onion or caper sauce with roast or boiled mutton not only makes the mutton nicer, but adds to the dinner. Tea should never be taken with meat, as the tannin in it makes the meat fibres tough and leathery.

After dinner there should be at least half an hour's rest —time to do as we like in; read, sew, or write letters. Brain work, or exercise, directly after a meal means that the blood needed to supply the digestive juices is diverted to the brain or limbs. For the same reason people should not bath or bathe after a heavy meal.

If possible, always have a choice of dishes at meals. Girls should have as much as they can eat, and should be encouraged to ask for second helpings. They often stop eating because the others have stopped, or the food is finished, not because they have had enough. A girl who goes to one of the best schools in England remarked to me quite simply that "there often is not as much food as we want." Schoolmistresses forget that girls who have to grow as well as work must eat in proportion, and so long as the food is wholesome, they cannot over-eat. We had a distinction among ourselves at school between "greedy-hungry" and "hungry-hungry." The distinction drawn is an important one, but girls may often *appear* greedy when they are really only satisfying their need for a particular kind of food. (This is especially true with regard to sugar.) No one is of much use in the world without self-control, and it cannot be bought for nothing. As regards food, most girls are apt to care too little for eating. On the other hand, Lent, or the time of self-denial advocated by widely differing religious codes, has a very real value in education, as also has training for games. They emphasize the fact that self-mastery matters more to us than the satisfaction of every passing desire, however harmless in itself. I need hardly say that such self-denial must be entirely voluntary and limited to luxuries. If we give up things ourselves and make other people do so without clearly understanding the reason for it, we may encourage humbug! "I have made my resolution," said a small girl once, bursting with importance. "I am not going to eat *any* bread and jam!" "But, Stella," I said, "you know you hate bread and jam." "Oh, well," said Stella, rather taken aback, "I don't exactly mind it"!

Another great help in learning and teaching self-control lies in getting into the habit of always sharing luxuries, such as sweets. Again it must be borne in mind that if the sharing is compulsory it is only a half-measure. It is completed when a girl *prefers* sharing to having a thing to herself.

As I have already said with regard to the difficulty some girls have in eating fat, it is cruelty, and very foolish cruelty, to force children to eat what they especially dislike. Leave the matter alone for a time, and then let them try again. We must never forget that as time goes by we all become blunted; and perhaps—partly because of this—we find self-control easier: girls have senses often extraordinarily keen, and self-control can only be gradually learned.

It is impossible to lay down any afternoon arrangements, as they must differ according to circumstances. Speaking generally, not more than four hours should be allowed to elapse between meals; and where a late high-tea is the plan adopted, the girls should be allowed bread and butter, or fruit, etc., in the afternoon. The habit of substituting odd cups of tea for food is very prevalent among schoolmistresses, but girls need *feeding*, not stimulating — unless they are ill — and they are far better with milk or water in between whiles. Neuralgia often shows that a girl is going too long without food, and a glass of milk between meals will sometimes stop it. It is extraordinary how indifferent working-girls are to this food question. They will go long stretches without food—often, alas! from motives of economy; and they want teaching both by precept and practice that lack of food means poor work and wasted time. A delicate girl who gets periodic neuralgia in the morning should have something to eat before she gets up till she can go without, and the same applies to girls when travelling. Whether we like it or not, our body is an engine which needs frequent stoking, and we are wiser if we recognize the fact.

Indigestion.—The first symptom of indigestion is that we become more interesting to ourselves and less so to other people! Hence when your view of life becomes gloomy look to your digestion.

Where the digestive juices are unable to cope with the food eaten, and the canal fails to absorb or get rid of it, this food may be converted into poisonous substances from which bad gases are given off; the gases cause flatulence; the poisons may, by passing into the blood, affect the whole body. Hence indigestion gives rise to skin trouble—spots and pimples—and headaches where the nerves are ill-fed, often also to a general feeling of misery and gloominess, without our knowing why.

The common causes of indigestion are—

(1) Constipation. (2) Bad teeth.

CONSTIPATION.—Girls must be taught the importance of regular habits, and, what is more, they must be helped in every way to form them. Of course, the foundation should have been laid when they were small children, but anyone with knowledge of the poorer classes knows that the necessity of internal cleanliness is simply ignored. I have known a girl go for a week and say nothing. At the same time it is a subject on which we are rightly reserved, and any talking must be done so as not to wound susceptibilities. Habits vary a little with individuals, but in general girls should get rid of their waste matter (fæces) regularly every day. When this is not done the following signs usually show that something is wrong in this way:—

Failing appetite for breakfast.
A white, furred tongue, and a nasty taste on waking.
A muddy or pasty complexion.
Headache—often in the forehead.
Irritability of temper.

At school I think it is best for the matron always to be on duty at bedtime, and the girls should be told to let her know at once.

Where anyone has trouble in this way it is no use giving *medicines* if you can get at a common-sense cause for it. Constipation may be traced to—

Carelessness and want of regular habits.
Lack of exercise, especially of the abdominal muscles.
Too little water.
Faults in diet; want of meat, fruit, and vegetables.

Carelessness.—An immense amount of constipation among girls is due to nothing but carelessness. They are in a hurry in the mornings, and are busy with other things; and where they have been ill-trained as little children the habit is difficult to form. In most cases it is best to seek relief directly after breakfast, and allow time to do so.

Lack of exercise.—Walking is one of the poorest forms of exercise. Swimming and garden work, digging and riding, are excellent. Anyone with this particular trouble should rub herself hard after the morning bath, using a circular movement from right to left, and do the following exercises ten or twelve times:—

1. "Stand with the arms lifted straight above the head, and legs slightly apart, and bend forward without bending the knees, until the tips of the fingers touch the floor; rise slowly."
2. "Lie on the back full length, stretch the arms above the head, raise the body from the waist till sitting, bend over till the hands touch the feet."
3. "Lie full length on the back with arms above the head and raise the feet, keeping the knees stiff."
4. "Stand upright with one arm stretched above the head and the other to the side, bend sideways till the position of the arms is reversed."

Common sense must always be used in exercising, and a girl should stop before she is tired out.

Too little water.—At least three pints of fluid should be taken a day; and it is as good to drink water between meals as it is bad to eat. The one helps to dissolve the food and cleanse the tissues; the other keeps the digestive tract always irritated. A glass of cold water before breakfast may help to put constipation right.

Faults in diet.—Where too much soft food is eaten, the muscle walls of the digestive tract get slack, and more meat is the best corrective; on the other hand, vegetables and fruit stimulate the intestine, and the trouble may be due to lack of these. Many girls are cured by plenty of fresh and stewed fruit; figs, bananas, and prunes are useful, especially when eaten early in the day. In other cases where the intestine acts in a sluggish way, rough food such as brown bread may by its irritant action help to restore or create regular habits; little children are sometimes helped by more oily food. Where *none* of the above are effective, recourse must be had to laxative drugs; it is better to take a sufficient quantity every night to ensure regular habits till the trouble is cured than to take an occasional dose! Cascara, syrup of figs, and senna are all effective and simple. The newest treatment is a teaspoonful of pure tasteless paraffin three times a day. Coffee is a laxative; so is honey.

BAD TEETH are responsible for an immense amount of indigestion, as the girl is constantly swallowing poison; and the same is true of unbrushed teeth when food is allowed to accumulate and decay in the mouth.

Diarrhœa is usually the result of poison, or any food which over-stimulates the intestine. A dessert-spoonful of castor oil (less for a child under 12) is the best remedy in a mild case, as it removes the offending substance. The girl with a severe attack should go to bed, take *only boiled milk*, and keep warm till a doctor can be called. People who cannot get to a doctor should always keep a good diarrhœa mixture at hand in case of need.

In cases of severe abdominal pain, the doctor should *always* be sent for *at once.*

Appendicitis is inflammation in a narrow blind duct leading off from the first portion of the large intestine. It occurs in people who suffer from chronic constipation, and often follows an overdose of magnesium salts. To prevent appendicitis one must remove the chronic constipation.

Generally speaking, for *any* illness where a girl complains of severe pain, bed with a hot-water bottle is the best place. I have known a poor little girl struggle to school with appendicitis because "it didn't seem bad enough to stay away." Where no doctor can be had, and there is intense pain, flannels dipped in boiling water, rung dry through a bath towel, then sprinkled with turpentine and placed where the pain is worst, give relief. As they cool, fresh flannels must take their place.

Sickness.—Where a girl in apparently good health is sick, the cause is probably indigestible or poisoned food, and the best remedy a dessert-spoonful of castor oil. If the sickness cannot be traced to food, it may be due to nervous disturbance—a fall or blow on the head, sudden shock or fright, or new conditions which the nerves cannot cope with, as in sea-sickness. In all such cases it is best to lie down and keep warm, but in a fresh atmosphere. A hot-water bottle at the pit of the stomach may give relief, and small sips of cold water. Only very light, digestible food is of any use, and in any serious case starvation till the doctor arrives is best. In sea-sickness dry, hard biscuit often stops the feeling of nausea, and it is important to keep thoroughly warm.

Where sickness is persistent, medical aid should be sought, as it points to general ill-health or disease of the digestive organs. Delicate or anæmic girls often cannot digest what strong ones enjoy. A feverish child can only digest light food. Milk, fish, chicken, junket, beaten up eggs are among the foods advised when ordinary diet is inadvisable.

CHAPTER IV.

FRESH AIR AND BREATHING.

PEOPLE very often talk as if the only "food" we had to think about were the beef, bread, and pudding that we had for dinner. We could live for some days without this food, but there is another of such importance that without it we die almost at once. This other food is the oxygen which we take in with every breath we draw.

If we want light or heat in a room, we get it by putting a match to the fire, or lighting a candle, and then the fire or the candle will give out a great deal more light and heat than it took to set it going. Directly we shut the fire or candle away from the air "it goes out." If you hold a tumbler near the lighted candle, drops of water condense on it; lime-water held close at hand will form a fine white powder. Now, all this simply means that the stuff of the candle begins to unite with the oxygen in the air directly the lighted match has made them warm enough. Then when the oxygen and the candle stuff unite, heat and light are set free, and the oxygen and candle by their union form water and a colourless, poisonous gas, carbon-dioxide; it is the carbon-dioxide from the burning candle which caused the white powder to form in the lime-water.

"And what has all this to do with breathing?" we may well ask. Everything! The food we take in is the candle, the oxygen is in the air we breathe, and when these two unite in our tissues, heat and the energy which enables us to work are set free, and water and carbon-dioxide are formed; these are of no further use to us, so we breathe them out as soon as possible. Anyone who has sat in a shut-up railway carriage on a cold day and watched the water streaming down the inside of the window-panes knows that we give out water. We can see that it is breathed out any frosty morning, and we can see that we breathe out carbon-dioxide by breathing into clear lime-water—the white powder forms at once. Of course, the important part of the process to us is the setting free of heat and energy, without which we could no more work than a machine can, until you put a driving force behind it. Most of the work we do is due to oxygen uniting with the substances in our bodies as with the candle.

"Pure" air contains 79 per cent. nitrogen, 20·96 per cent. oxygen, and ·04 per cent. carbon-dioxide. The air we breathe out contains 79 per cent. nitrogen, 16·3 per cent. oxygen, and 4·7 per cent. carbon-dioxide. Thus the nitrogen remains unchanged, and a large part of the oxygen is absorbed, while carbon-dioxide is given out in its place. If a room is closed up and people are breathing in it, or there are fires and lights, the air will contain less and less oxygen, and more and more carbon-dioxide. We do not only breathe out air, but also various impurities and water vapour which the body has no further use for. If we have a cold, every breath will contain the germs which cause it, and any decayed matter in mouth or air tubes may be got rid of in the same way. Stuffiness is due to these impurities and to stale perspiration when there is not enough ventilation in a room to carry them away.

If people live in rooms where there is too little oxygen and much breathed-out air, they are drowsy and headachy. A stuffy schoolroom sets everyone in it yawning. I read lately of two little children used to an out-of-door life and open windows. One day they were asked to tea with a little girl whose nursery door and window were shut tight, while a gas fire blazed in the room. Those children came home and slept on next morning exactly as if they had been drugged. Constant stuffiness means constant drowsiness, and not our brain only, but our whole body is half asleep. We are like fires, and just as the fire outside blazes and has a big appetite for wood, so if we live in the open we are full of energy and want plenty of food. The fire supplied with plenty of air burns keen and bright; stop the draught or air supply, and it burns slowly, sooting up the chimney. The "fresh-air person" is bright eyed and clean skinned, the "stuffy-room person" is lacking in energy. Her tissues are silted up with the waste products which she has failed to burn up, and she has little appetite. If you want to keep well, live out of doors and sleep with open windows, but of course it does nobody good to shiver! You must have plenty of food to combine with your oxygen to get heat from, and warm clothes to keep in that heat.

If so much depends upon breathing, it is important to keep our breathing machine in good order and to know something of the way in which it is built up. We should always breathe in through the nose, not the mouth. The air is warmed and filtered as it passes over the mucous membrane and small bones at the top, and it then passes from the back of the mouth down to the windpipe or trachea. This windpipe is the hard tube which we feel in the front of the throat; its entrance is guarded by a flap which closes over it whenever food passes over on its way to the gullet, and rises up when we breathe in or out. Just below this flap is the voice box or larynx. Both the voice box and windpipe are kept stiff by bands of cartilage. The lower cartilage of the larynx is a ring; those of the windpipe are C shaped, so that the tube is stiff in front, but soft behind. If we take too big a mouthful or swallow a hard sweet, it hurts, for just as it passes the ring-shaped cartilage the gullet will be pressed hard against it; for the rest of the way down it will only push against the soft part of the windpipe.

The windpipe runs down into the chest and then divides to right and left into the two bronchi; these divide and divide again to form innumerable very fine branching bronchial tubes, each of which finally opens into a tiny elastic air cell; each air cell is surrounded by minute capillary blood vessels. The right and left lungs are built up entirely of the air cells, blood vessels, and bronchial tubes, and are like two great closed sponges filled with air ; each lung is covered by a bag consisting of two layers of very fine membrane. These two layers only join at their edges. The outside of this bag or pleura lines the chest ; the inner layer covers the lung. Both layers make a little fluid, so that the lung can move easily in the chest without rubbing. If too much blood goes to these layers or they secrete excessive fluid, we get pleurisy, and every breath or movement of the lung may be painful.

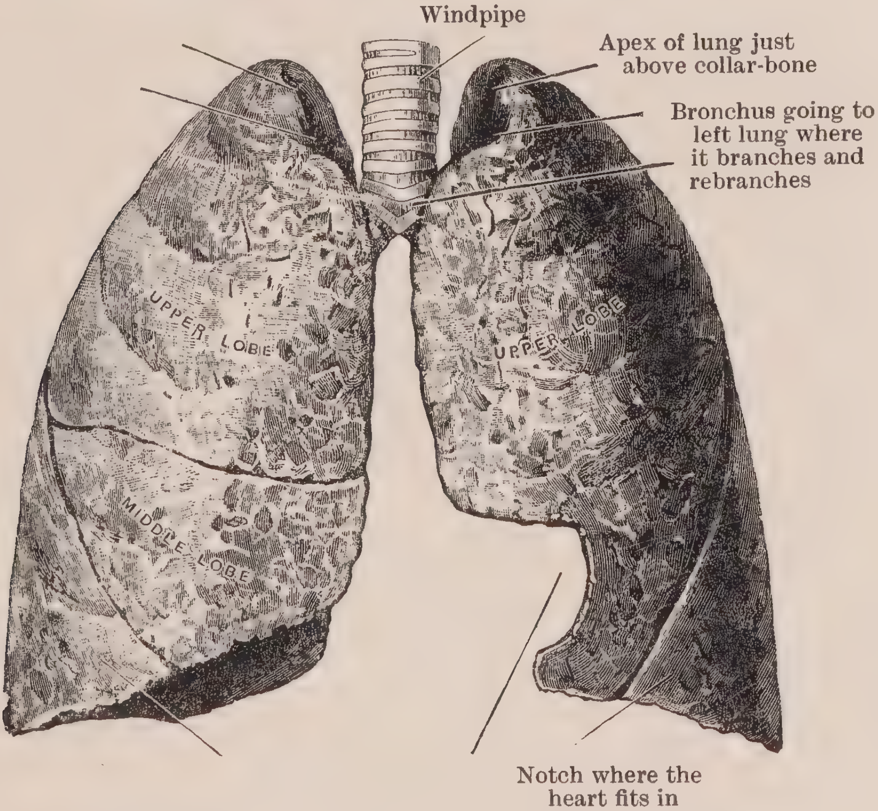
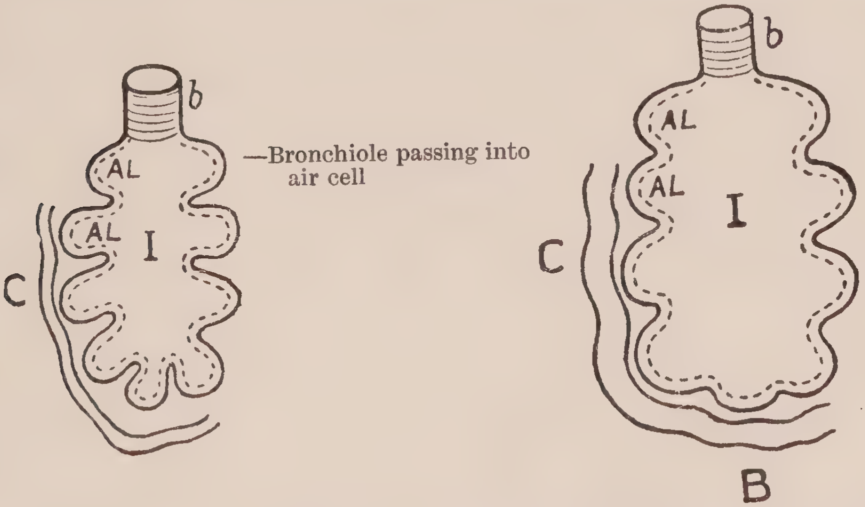

Windpipe
Apex of lung just above collar-bone
Bronchus going to left lung where it branches and rebranches
UPPER LOBE
UPPER LOBE
MIDDLE LOBE
Notch where the heart fits in

FIG. 4.—The lungs and lower part of windpipe.

The lungs fill up all the chest space not occupied by the heart. Just below them, dividing the chest from the lower part of the body, is a great sheet of muscle which curves up in the centre—the diaphragm. The whole chest is rather like a champagne bottle with movable sides and base. The windpipe is the neck; the ribs, breast, and backbone, with the muscles connecting them, form the sides; and the diaphragm the curved base. When we breathe in, the top rib remains stationary, the other ribs each move up, and as the lower ribs are larger semicircles than the upper ones, the breast-bone is thrown forward, and the chest expands from back to front. At the same time, the diaphragm contracts so that the part which curves up into the chest is pulled down, and the chest is made bigger from bottom to top. You can feel these movements quite easily if you take a deep breath.

Now, all the little air chambers of the lungs are elastic, and they are in direct communication with the air outside by the bronchi, the windpipe, and the nose. Hence, as the chest expands, more air passes into the air chambers, so that they fill up the space between lung and chest wall, which would otherwise be left empty, *i.e.* they expand also. Then the ribs move down, the breast-bone sinks in, the diaphragm rises again, so the air cells have less space and their elastic walls contract, sending the "breathed" air up the air passages and out. We breathe from 12 to 20 times a minute.

When the fresh air reaches the air cell it finds itself in close contact with the blood in the capillaries. Now, in this blood are a number of small flat discs, which look yellow under the microscope, red when you see millions together—the red blood corpuscles. These contain a substance, hæmoglobin, which, so to speak, attracts oxygen; part of the oxygen of the inbreathed air passes through the thin wall of the blood vessel, and the blood yields up carbon-dioxide in its place. The red blood corpuscles now pass on in the blood stream, carrying the oxygen with them back to the heart, from whence it can be sent to any part of the body in which work has to be done and energy is needed. If a girl has too few of these red blood corpuscles, or they have too little hæmoglobin, she is said to be anæmic. She gets breathless, and feels tired and unfit for work. An iron tonic will help her to form the hæmoglobin, and she must rest a good deal and be out of doors as much as possible. Sometimes anæmic people do not look ill, but the gums and inner lining of the lips and lower eyelids are pale and show that the colouring matter is wanting.



—Bronchiole passing into air cell

Fig. 5.—A single air cell from the lungs collapsed when air is breathed out, and expanded during inspiration (magnified about thirty times).

Everyone should get into the way of using all their lungs and not just a little bit at the top. If we do not use parts of the body they are much more liable to disease. One of the worst things about tight clothes is that they prevent us from using the lower parts of our lungs.

BREATHING EXERCISES.

All arm exercises help to develop the chest.

Hanging by the hands from a bar helps us to keep the backbone straight and the shoulders even.

Breathing exercises are all-important in the treatment of lung troubles—and prevention of lung troubles.

For instance, a girl whose family history shows tubercle, or pneumonia, or bronchitis, should most certainly be taught breathing exercises—

Exercise 1—

Stand erect by the open window.

Feet together.

Mouth shut.

Arms down at the side.

Draw in the air slowly, keeping the chin out. Slowly let out the breath.

This should be done time after time, breathing as deeply as possible.

Exercise 2—

With each inspiration slowly raise the hands high over the head, keeping the arms straight.

With each expiration slowly lower the hands to the sides again.

Exercise 3—

With each inspiration slowly rise on the tip of the toes.

With each expiration slowly sink again.

Exercise 4 (Swimming Movement)—

Let the arms be stretched out in front on a level with the shoulders.

With each long-drawn inspiration move the arms backwards, keeping them in the horizontal position.

With each expiration move the arms back to the forward position again.

Breathing exercises need not be carried out only in such a specified way as this. A man who had suffered from pleurisy and an adherent lung told me that he took a few deep, prolonged breaths whenever he thought of it, and in that way he was able to break down the adhesions and get the lung back to its normal condition again.

CHEST TROUBLES.

All the air passages are lined with a fine membrane which is supplied with blood vessels and pours out a fluid called mucus to keep it smooth and moist. If much blood is sent to any part, that part becomes inflamed and too much mucus is secreted. If this happens in the nose, we say we have a cold in the head; if in the larynx, we are hoarse and cannot speak. The trouble may spread farther down to the bronchi, and is then known as bronchitis. If the inflammation is in the air chambers themselves, the person has pneumonia. This explains how, what begins as a simple cold may end in serious illness. Of course, if too much mucus is formed, the air passages get choked, and breathing becomes difficult. We cough, forcing air out to get rid of this obstruction. In the same way we cough if a crumb goes down the wrong way.

In all chest troubles people must be kept thoroughly warm, with plenty of fresh air, and this air must be warmed and moist; a steam kettle will often give relief. Such illnesses are probably largely due to bacteria or small plants, and for this reason nothing which is coughed up should ever be swallowed, or other parts of the body may be infected. Consumption causes destruction of the air cells.[1]

This is a long, dry chapter, but the practical import of it may be summed up in very few words.

If we want to work our best we must have oxygen, so live and sleep in pure air. No room is so fresh as out of doors.

The oxygen is carried by the red blood corpuscles; never neglect the beginnings of anæmia.

Any disused part is liable to disease. Use all your lungs, not a little bit.

Never neglect a chest cold or cough.

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[1] See chapter on "The Blood Stream and Infectious Diseases."

CHAPTER V.

NOSE, THROAT, AND EAR.

THE NOSE.

WE saw in the last chapter that the air cells of the lungs are directly connected with the outer air by a series of passages, which are always open, excepting when food is passing over the larynx. The upper parts of the air passages are of great practical importance, for if they are ill-kept, or infested with microbes, we are always more or less uncomfortable.

The proper way to breathe is *through the nose*: this consists of two nostrils separated by a bony partition and leading into the throat; just below the eye a small passage runs from the opening at the back of the nostril to the ear—the Eustachian tube.

The nostril is lined, like all the air passages, with mucous membrane, a very fine skin containing blood vessels, nerves, and small glands, which pour out a fluid and keep the surface moist. There are also a number of fine hairs and little soft threads or cilia which can only be seen with a microscope; at the top of the nose are a number of very fine spongy bones curved so that they look like scrolls of bone stuff. Just where the nose passage opens to the throat there is a little mass of spongy gland-tissue.

When the air goes up through the nose it is made warm and moist as it passes over the blood vessels and damp membrane; the small hairs, cilia, and spongy bones at the top act as a filter, so that dust and any solid impurities are prevented from entering the throat. The little mass of tissue just where the nose passage runs into the throat entraps any germs that are coming in with the air. If we breathe in by our mouth instead of through our nose, all these filtering and warming arrangements are useless.

The nose nerves are specialized to carry messages about smell to the brain, and they do a great deal more work than most of us imagine, for there are many things which we think we taste when we are really only smelling them. If we shut our eyes and hold our nose, we cannot tell the difference between apple and onion! Most of us know that when we have a severe cold, and the nerves of smell are muffled, we get very little pleasure out of a toothsome dinner. A great many disagreeable medicines can be taken easily if you don't smell them first, and hold your nose till they are swallowed and the mouth rinsed out!

Troubles in the nose are usually due either to some obstruction of the passages, or to the lining getting inflamed, *i.e.* overcharged with blood. It is quite easy to see whether the air passages are clear by shutting the mouth and closing first one nostril then the other, while you breathe out. If this is difficult to do, there may be some small obstruction present, which a doctor can remedy. All little children have to be taught to blow the nose properly to prevent mucus and dust accumulating in the passage.

If the lining of the nose is irritated, more blood is sent to it, and the mucous glands secrete too much fluid. The little glands of the eye are also affected, and your nose runs and eyes water. Sometimes this irritation is due to small plants (bacteria[1]), and then we say we have a cold. The same thing happens if we smell anything irritating, like ammonia: the nerves carry a message to the brain, and a message comes back bidding blood vessels open wide and glands work. One of the most troublesome complaints of this kind is hay fever, which is probably caused by the pollen dust from the flowers getting blown up the nose and irritating the lining. The following ointment, if squirted from a little tube into the nose, often helps to stop it:—

Anæsthesin	gr. xx.
Atrop. Sulph.	gr. i.
Paraff. molle dil.	ʒ i.

Fiat unguentum.

Anyone who has constant colds had much better have the nose and throat carefully examined by a specialist. There is something wrong which needs attention.

Bleeding from the nose is troublesome, but not usually serious. Lie down, keep quiet, and sponge the nose with very cold water.

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[1] See chapter on "Infectious Diseases."

The Throat.

The throat is like a turnpike where several roads meet. There is a main road from the mouth down the food canal. There is a second main road from the nose with little side tracks running up the Eustachian tubes to the ears, and this crosses the first and runs down the windpipe.

When food is being swallowed a small flap closes over the windpipe like the lid of a box, and so prevents particles "going the wrong way"! If the flap does not shut quickly enough and a crumb gets into the larynx, we cough till it comes up again.

At the sides of the throat are two sentinels, the tonsils, who entrap the microbes and prevent them doing further mischief. They are small glandular swellings, and usually project a little from the recess in which they lie. Above the tonsils and at the back of the nose is the little mass of glandular tissue, already referred to, whose work is also to entrap microbes. If it becomes enlarged, it blocks up the "back door" of the nose. This block is known as "adenoids."

The soft palate ends in the uvula, a small point sloping down a little in front of the tonsils.

If the throat is to be kept well, the gums and teeth must be clean and healthy. Some girls are "bothered" by their throats. They are not ill, but always not quite well. Repeated gargling with salt and water (one teaspoonful salt to one cup of water) often helps a weak throat of this sort. A tickling throat usually means that the uvula is enlarged. Painting regularly, morning and night, with tannin and glycerine may stop the trouble.

Loss of voice is sometimes due to cold, sometimes to want of nervous control, or the muscles which have to do with voice are overstrained. The general health wants seeing to, and the voice must be rested.

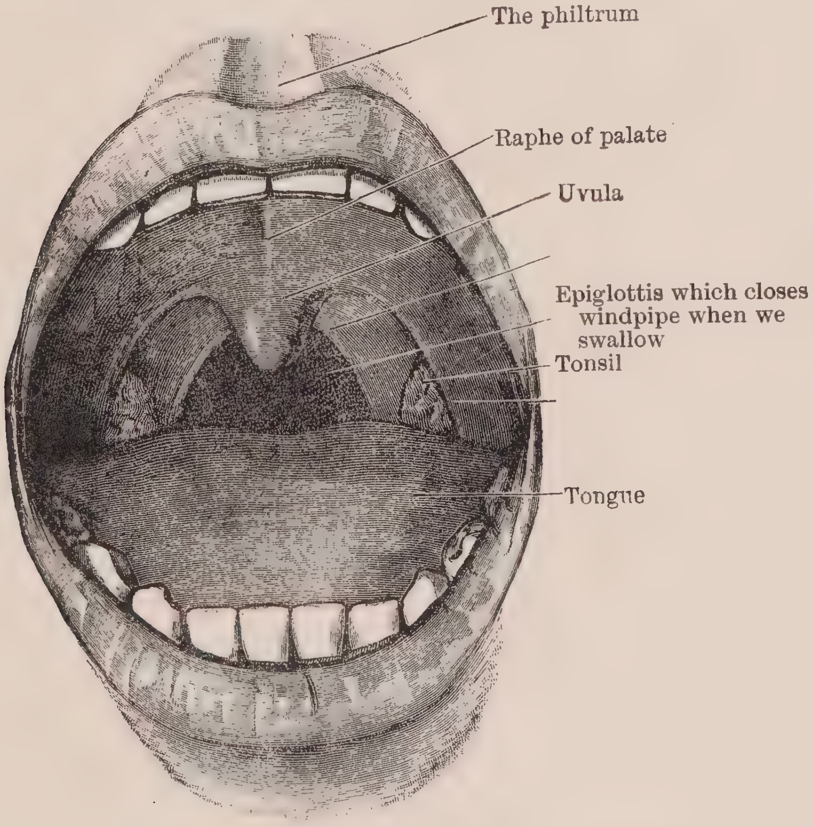

Fig. 6.—Mouth opened to show uvula and tonsils.

Throat troubles are very important, and must not be neglected; for they may extend along so many lines, and become very serious.

Sore throat.—An ordinary sore throat is from the same cause as a cold in the nose. The lining membrane of the throat appears swollen and red; swallowing is uncomfortable; as a rule there is a certain amount of headache and fever from the poison absorbed into the system.

When a sore throat comes on suddenly it is much better not to see more people than necessary, first because troubles of this kind are slightly infectious, and secondly because they often precede an infectious fever —scarlet fever, measles, etc. If possible, keep in bed in a warm, well-ventilated room.

The food should be meagre and light. Hot lemonade is an excellent beverage. A muffler or flannel round the neck gives relief, or some warm wool such as thermogene, and a throat spray of weak listerine should be used. Menthol and eucalyptus lozenges are often a relief. In all cases of sore throat, the neck should be felt, and the region under the mouth should be examined for little firm masses or glands. Normally these cannot be felt, but sometimes, owing to an inflammatory condition of the throat, they swell up; and it is best to let the doctor know about them.

Tonsilitis.—When the inflammation of the throat is not general, but is localized in the tonsil, the illness is called tonsilitis. There will be sore throat, furred tongue as before, headache and temperature. But instead of the throat being swollen generally, the tonsils will stand out as swollen masses, obstructing the passage of food.

The treatment is exactly the same as for sore throat.

Quinsy.—In quinsy the swelling of the throat is localized. One tonsil will probably be larger and redder than the other, and the swelling ultimately forms an abscess which bursts. There is throbbing and pain at the side of the neck, which is much relieved by a hot fomentation. The treatment is to get a surgeon, who will incise the swollen tonsil before the abscess bursts, and so save suffering. Again, as with all cases of throat trouble, the glands in the neck may need special care.

Enlarged tonsils.—Chronically enlarged tonsils are due to repeated infection. In consequence they become damaged. They are no longer able to do the work of sentinels, and they ought to be removed.

Swollen glands are due to the fact that the tonsils have ceased to be able to do their work of destroying microbes which have got into the throat. The glands in the neck lie along a line running from behind the ear to the chest bone. These are the glands in communication with the tonsil; and the bacilli [1] which the tonsil cannot overcome pass into them. In consequence the gland becomes inflamed, as an increased supply of blood is always sent to any part of the body attacked by bacilli. If the bacilli win the fight, the gland "breaks down" and an abscess is formed. This becomes a serious matter, and can only be attended to by a skilful surgeon, for in this part of the neck there are important blood vessels and nerves. Thus it is very important to treat troubles of the tonsil at once, so as to prevent further complications. In the case of chronic enlargement of the tonsillar group of glands in the neck, when the glands are removed the defective tonsils also should always be removed, since they are the cause of the whole trouble.

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[1] For an explanation of "bacilli" and their work see "Infectious Diseases."

Adenoids (as has already been explained) occur when the small mass of tissue which guards the entrance from nose passage to throat becomes enlarged. It blocks the nose, and so prevents proper breathing. The block is to both nostrils, not one. The inflammation often extends up the Eustachian tubes, which run to the ears, causing deafness (see "Ears"). Just as tonsils which have ceased to protect from germs are worse than useless, so adenoids may harbour germs and cause constant colds in the head.

Mouth breathing and a tendency to chronic colds point to adenoids. Snoring, a look of vacancy, and slight deafness are additional signs. If you cannot breathe easily you are always hampered and half awake. In all cases the adenoids should be removed, and when that has been done you have to learn to breathe through the nose.

Breathing exercises should be done night and morning; *e.g.*, the head is thrown back, the hands are clasped behind, and then deep respirations taken, *keeping the mouth shut.*

Diphtheria is discussed in the chapter on "Infectious Diseases."

In all throat troubles the greatest relief can be obtained by steaming—that is, breathing warm moist air. When there is no proper bronchitis kettle, a jug filled with very hot water in which some disinfectant has been dissolved can be held near the mouth, and steam inhaled. The disinfectant helps to destroy the germs which are causing the trouble. A towel as a kind of tent over the head and jug will help to keep in the moisture. After steaming it is better to stay for some days in a warm room.

Gargling is useful for weak throats, but in sore throat constant gargling irritates, and it is better to paint or swab the throat out at regular intervals (see "Scarlet Fever").

THE EAR.

We have seen that just where the nose passage runs into the throat, a narrow canal leading to the ear is given off. If you could follow this canal up you would find yourself in a small chamber, and brought to a full stop by a tightly stretched slanting membrane which stretches from roof to floor—the chamber is the middle ear, the membrane the drum.

Communicating with the middle ear is a most complicated arrangement of tiny bones and tubes—rightly called a labyrinth; it is from here that messages of sound are carried to the brain. Part of the labyrinth has nothing to do with sound, but regulates the balance of the body: if this part is disturbed, as for instance when you turn round and round, you get a feeling of giddiness and may even fall down.

If, continuing your journey from the Eustachian tube, you made a hole in the drum and walked on through it, you would travel through a passage about an inch and a quarter long, and come out on the ear as we know it.

The ears must be kept clean, and well dried after washing; soap should not be allowed to get into the canal, and nothing but a soft towel used for drying. Many people have a very bad habit of poking something hard into the canal to clean it and get rid of wax.

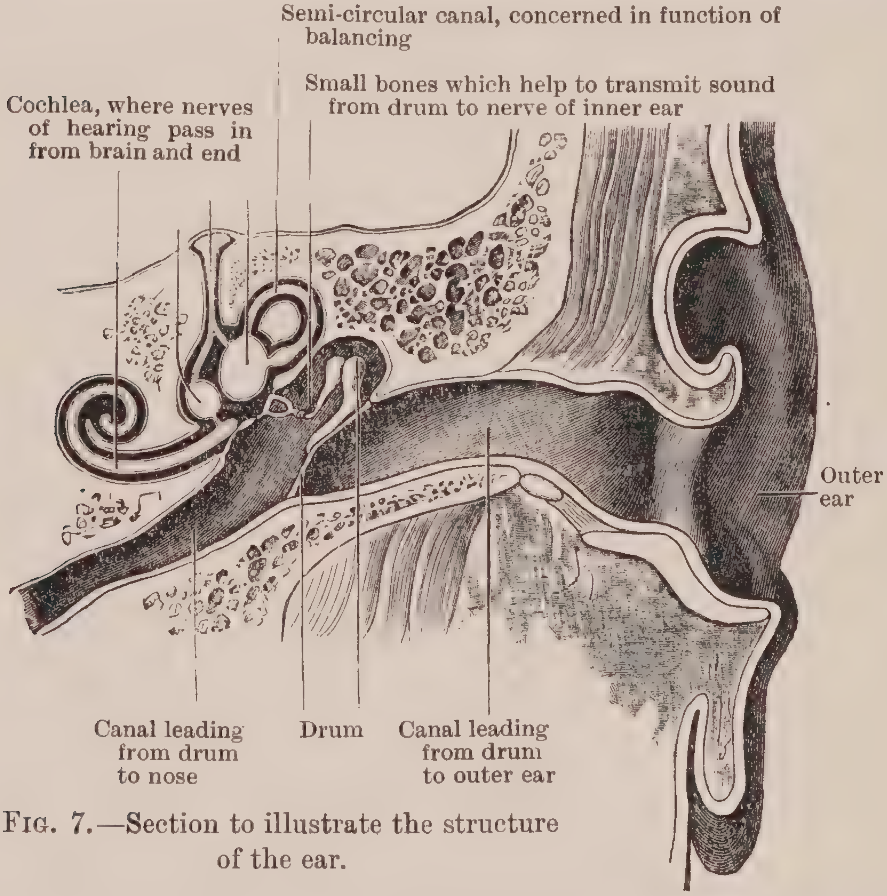

Semi-circular canal, concerned in function of balancing
Small bones which help to transmit sound from drum to nerve of inner ear
Cochlea, where nerves of hearing pass in from brain and end
Outer ear
Canal leading from drum to nose
Drum
Canal leading from drum to outer ear

FIG. 7.—Section to illustrate the structure of the ear.

This is really dangerous, for if they get down to the drum and injure it, deafness may follow. For the same reason, no chemical should ever be poured into the ear except by doctor's orders.

A little fluid "wax" is secreted by the drum membrane, and if this accumulates it may block the external canal and so cause deafness. Syringing is the remedy for this, but it must never be done without first consulting a doctor. A little warm (not hot) olive oil dropped into the ear softens the wax.

If the Eustachian tube is blocked, as it is when we have a cold in the head, the air which passes into nostril from outside cannot get through into the middle ear. As the oxygen is withdrawn from the air already there, the pressure on the inside of the drum will become less than the pressure on the outside, which is still in communication with the atmosphere. The result is that the drum is pushed inwards, it no longer vibrates properly, and we feel deaf. As the cold gets better the deafness will probably go; if not, a doctor can remedy it.

In earache, as in all pain, heat will give some relief. This is best applied as a fomentation.

If there is redness or tenderness behind the ear, medical aid should be sought *at once*; indeed, no ear trouble should be tampered with, but referred to a doctor.

It must be remembered that earache is sometimes due to a bad tooth.

CHAPTER VI.

PHYSICAL DEVELOPMENT.

TREES are common enough objects, and perhaps there is no more beautiful sight in nature than a leafless tree, each branch and twig sharply defined against a clear winter sky. We may well ask—Why all this infinite complexity of tiny shoots? And the answer is that they are the framework on which each leaf is spread out to the air and sun.

In our bodies there is also a framework, that each organ may be kept in its proper place, and carry on its work unhampered by its neighbours. We cannot stay rooted in the soil as can the tree, so this framework consists of a very complicated machinery of stiff parts which can be bent or straightened by bundles of elastic fastened to any two of them. The stiff parts are of course the bones, the elastic bundles the muscles. If we are to develop healthy bodies, the bones must be strong and well shaped, and the muscles quick to contract or relax when they receive a message from the nerves.

A young girl and a young tree are alike in this: their framework can be easily bent, and if you don't like the bend it may be possible to straighten it, and make another. The "grown-up" and the full-grown tree are also alike—you can break but cannot bend them. It is all important, then, that the bending should be on the right lines, for where it is not, not only will the framework look awry, but things inside may be displaced or too crowded to work properly. A girl who stoops does not only *look* awry; she is crowding up her lungs so that each part is prevented from working to its full capacity.

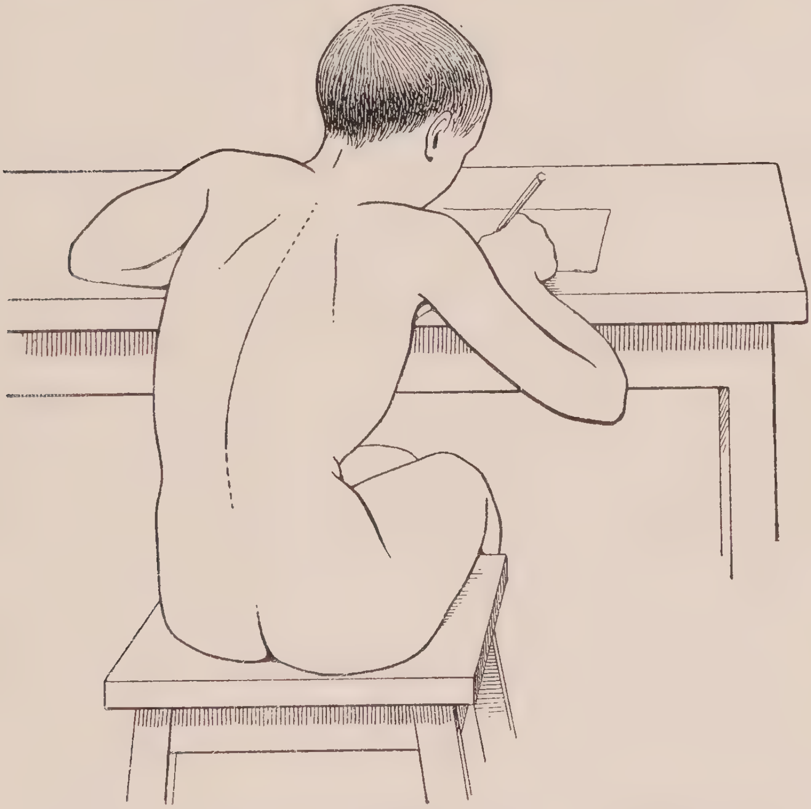


Fig. 8.—The effects of sitting crooked; shoulder, spine, and hip thrown out of place.

At birth the bones are quite soft. They harden gradually, as more and more mineral matter (mainly lime salts) is embedded in their substance. During youth care must be taken that one side of the body does not develop at the expense of the other, for one-sided development will mean uneven weight and constant pull towards the better developed side. Hence, violin playing, side-saddle riding, and hockey playing may all lead to a curved spine in bendable girls. When a girl has sprained her ankle or knee she is very apt to save

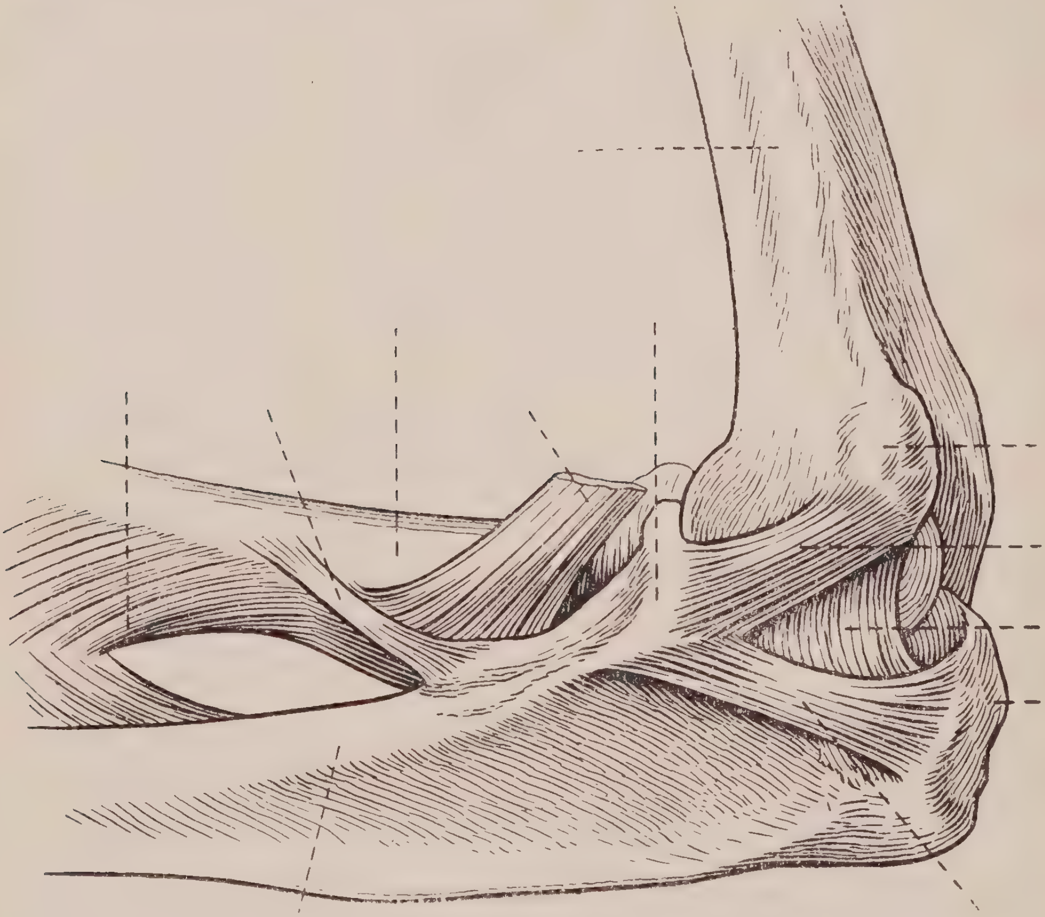


FIG. 9.—Elbow joint. The upper arm attached to the two bones of the lower by ligaments.

it afterwards by putting her weight always on the other foot, or she may simply have a habit of standing on one leg. In either case the spine suffers. Often the first thing noticed is that one shoulder looks higher than the other. Curvature of the spine is so common in growing girls that anyone in charge of them should look out for it, and medical inspection is most desirable. If discovered at the beginning, it is easily remedied by suitable exercises. When girls have a long walk to their work and heavy bags to carry, they should get into the habit of changing hands. The less weight they carry the better.

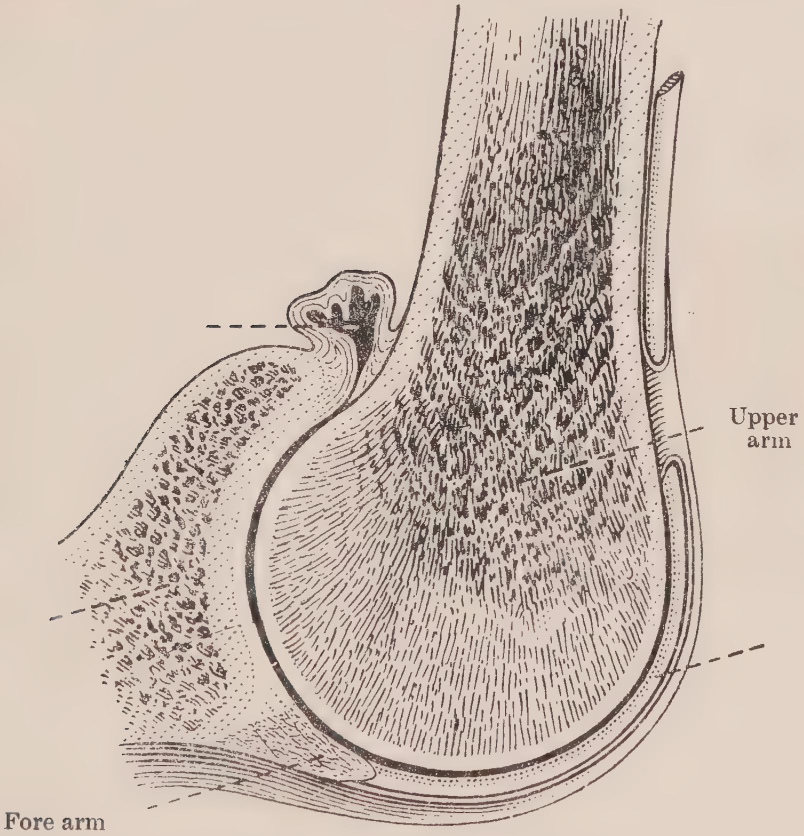
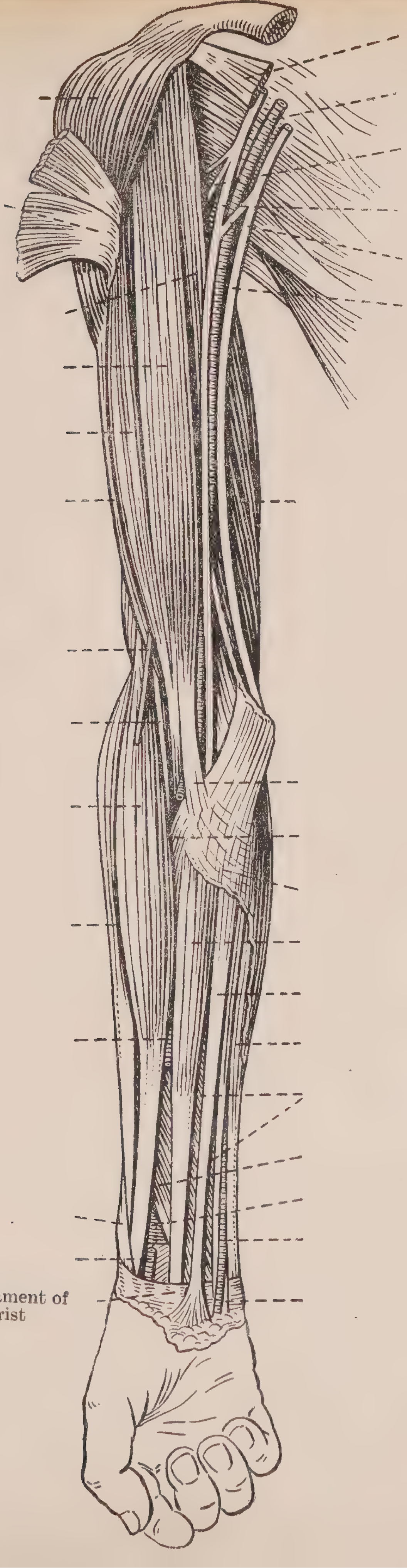


FIG. 10.—Section through the elbow joint.

Bones are usually attached to one another by strong bands or ligaments, and the place where one bone meets the next is called a joint. The end of each bone is usually capped by cartilage and fine membrane. This membrane forms a two-layered bag, and pours out fluid to make the surfaces move easily on one another. When the joint is injured, too much liquid is poured out, and we get "water" on the joint. This may be prevented if the joint is covered at once with lint soaked in lead lotion.

The ligaments fasten the bones together, but they do not hold them in place or move them. This work is done by the muscles. Muscles are built up of very fine fibres. In those muscles which move the bones these fibres are long and finely striped; they are usually arranged in bundles covered with a fine skin; then these bundles are bound into bigger ones, and so on. The skins run out at both ends farther than the fibres in the bundles, and become all twisted together to form a strong cord or tendon. It is by these tendons, and not by the fibres, that the muscle is fastened to the bones. In the internal organs the muscle fibres are usually unstriped and spindle-shaped. They are not fastened into bundles with a tendon at either end, but arranged so as to form a coating or sheet where they are required. For instance, the chest region of the body is separated from the abdominal by a sheet of muscle which stretches from side to side, and rises and falls as we breathe—*i.e.*, the diaphragm. All the blood vessels are coated with muscles which run round them



Upper arm showing muscle with its origin in the shoulder. Its tendon is inserted below the elbow, so its contraction will raise the fore arm

Fore arm showing muscles with their origin at the elbow, and tendons inserted into the wrist and hand

The contraction of the fore arm muscles causes bending of the fingers

FIG. 11.—The right arm with skin removed to show the muscles.

and make the bore of the vessels smaller when they contract. In connection with all muscles are numerous fine blood vessels and nerves. If you tease out a small piece of meat and put it under a microscope, you can see the fibres of which it is built up.

All muscle fibre works by contracting and relaxing, and so causes movement. Some muscles are generally contracted: for instance, those which keep the shoulder blades back are contracted so long as you are upright, and when you stoop they relax. On the other hand, the biceps (which lies on the inside of the upper arm, and is attached to the lower arm just below the elbow) is usually relaxed, but contracts to bend the elbow, and bring up the lower arm. When muscles are in good order they will contract or relax promptly whenever a message is brought them by the nerves. We all know the difference between a trained squad whose muscles respond at once to a given order, and the raw recruit trying to do the goose step.

Children are born with all their muscles, but only use can develop them. Whenever we move, chemical action takes place in the substance of the muscle, and waste products are formed. It follows from this that the fibres must all the time be supplied with fresh blood to make up for the loss, and that they must get rid of their waste products. Now, after a certain amount of exercise waste products begin to be formed faster than they are got rid of; then we begin to feel tired. This explains why it is that too much exercise does not make a muscle strong, and may even cause it to waste. We have all heard of people who write or play the violin too much, till the muscles strike and refuse to work at all. If a girl has let her muscles grow slack and then plays hockey, she cannot get rid of waste products quickly, and will feel very stiff afterwards. If she takes a hot bath directly after her game, it will help excretion and prevent the stiffness.

All healthy girls need plenty of exercise. It not only develops the muscles, but quickens the circulation and breathing, more oxygen is taken in, waste products got rid of, and we "live" instead of merely existing. Walking is poor exercise compared with running games, and when a girl takes no pleasure in such exercise the cause should be sought. She may be overworking, for if the nerves are exhausted she is bound to feel tired, and running becomes a painful effort: her heart may be weak: she may be anæmic and get giddy and breathless: or she may be lazy! In any case, games should be begun gradually, and the amount of exercise steadily increased. In some schools girls never run during the week, and they then play a hard game of hockey on Saturday afternoon. They probably spend a good part of the following week in getting over it. Even when frequent play is impossible they can run every day, and so fit themselves for playing when they have a chance.

From a health point of view net-ball is one of the best games a girl can play, as it brings so many muscles into use, and is not one-sided. Hockey is unrivalled as an interesting game, but it is too strenuous for delicate girls, and the one-sided position is bad. Girls who play should have steady practice in running, or there is great danger of heart strain, so much so that one specialist states that every girl who has come to him with heart strain has been a hockey player! In some big girls' schools lacrosse is taking the place of hockey, and where a game is played practically every day this seems desirable. The drawbacks are that it is difficult to learn, needs continual practice, and plenty of space with no windows at hand. The advantages of cricket over tennis have nothing special to do with its excellence as exercise! Both teach quickness of eye and muscular co-ordination.

Dancing, fencing, and swimming are hardly games, but are of great value to growing girls, as they are keenly enjoyable, and bring many muscles into play.

As no one form of recreation will teach the use of all muscles, games should be supplemented by regular drill. This should always be given by someone who has studied muscular development and co-ordination and understands what she is working for. Drill once a week is a farce, and daily practice, if only for a few minutes, should be aimed at. When girls are allowed to do daily exercises by themselves they should be frequently made to repeat them before the drill mistress, as otherwise they may form bad habits and do themselves more harm than good. When girls do exercises on their own account, they should use their common sense and think why they are doing each exercise. Tight clothing for growing girls is anathema. It hinders muscular development, it checks deep breathing, and so may help to establish lung trouble. It may cause internal displacement by forcing the delicate organs which are unprotected by a bony covering into unnatural positions, and thus may give rise to lifelong ill-health. The ideal dress is a gymnastic suit with as little in the way of petticoats as possible. The hip girdle is not yet set, and any heavy weight on it may cause malformation.

Stooping and "*poking*" are very frequent defects in growing girls. The muscles which should contract firmly and keep shoulders back and head up are slack and weak. Plenty of rest, lying flat on the back, should be taken, and the following exercises used:—

Stooping.—1. Hang straight from a bar and swing gently backwards and forwards.

2. Put the hands to the chest, palm downwards, and fling them out vigorously, keeping them level with the shoulders.

3. Stand straight with arms at the side, raise the hand to the shoulders, then above the head, back to the shoulders and down again.

4. Stand upright with hands on the hips and take deep breaths.

These exercises must be done vigorously, remembering that the object is to expand the chest and keep the shoulders back. Take care to keep the head well up.

Poking.—Stand upright with hands on the hips. Move the head slowly backwards, taking care to keep the chin in.

Girls with weak backs can do a good deal to help themselves by remembering to sit straight, with both feet on the floor, *not* crossed or hitched up on the chair! Sometimes they get into a habit of stooping because they always work at a table or desk too low for them.

Flat foot sometimes gives girls who are obliged to stand much a great deal of trouble. Such girls should do tiptoe exercises, bending the knees so that the heels come off the ground. They should stand on the outside of the foot rather than the flat, and wear laced boots in preference to slippers.

Cramp occurs when poisonous products accumulate in a muscle and the circulation is defective, so that they are not carried away. Sudden cold may bring it on, or lying in a constrained position. The remedy is movement and rubbing to restore the circulation.

Cramp in the stomach is another name for colic. Hot-water bottles give relief; but where the pain is severe, or the patient is tender and cannot bear to be touched, a doctor should be sent for immediately.

Pins and needles, when the hand or the foot "goes to sleep," is also due to defective circulation. The trouble is easily remedied by movement. It is prevented by improving the circulation—in other words, "keeping fit."

So-called *growing pains* are probably rheumatic.

THE HEART.

The heart is a very much specialized muscle built up entirely of curiously shaped fibres which fit into one another. It lies to the left side of the chest, with the pointed end downwards, in a space in front of the left lung. Vessels which bring blood to the heart are called veins; those which carry it away arteries. There are two chambers in the substance of the muscle, one on the right and the other on the left; and each chamber is divided into an upper and lower storey by movable flaps or valves which allow blood to pass down but not up. The upper chambers, or auricles, receive blood; the lower chambers, or ventricles, pump it over the body.

The right side of the heart contains only blood which is charged with carbon dioxide. This is poured into the upper chamber, and passes into the lower chamber; when the walls of this contract, the blood is forced out into vessels leading to the lungs. The blood vessels branch continually till the blood is running in one with walls so thin that they do not in any way prevent the passage of air. The oxygen from fresh air now passes into the blood, and its carbon dioxide is got rid of. The blood is now collected into larger and larger vessels, and returns this time into the *left* upper chamber of the heart. Hence, when the wall of the chamber contracts, it is passed to the left lower chamber, and when this in turn contracts it is pumped out to supply the whole body.[1] The heart beat is caused by contraction of the ventricles. This gives the pulse in wrist, neck, and temple, the artery walls first expanding and then contracting as the blood passes through them. Of course the farther the blood goes from the heart the more slowly will it be running; it finally finds itself in narrow vessels or capillaries, where it gradually gives up its oxygen and becomes charged with carbon dioxide. The blood is then collected up to be returned as impure to the *right* upper chamber. Hence there are two distinct circulating systems, that of the lungs which passes from the right ventricle through the lungs to the left auricle, and that of the *body* which begins in the left ventricle and ends in the right auricle.

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[1] The only way to really understand the heart is by working through the heart of a sheep, or some other fairly large animal.

The heart beats seventy-two times a minute, but considerably faster in young children. Exercise makes it beat more quickly.

If the heart muscle fails to contract properly the blood is not driven with force to the extremities of the body, and we say a person has a bad circulation. Blue lips and finger tips point to this weakness. Sudden fright, pain, or shock may affect the heart; the nerves send down a message, the muscle contracts weakly, too little pure blood is sent up to the brain, and we faint — or perhaps turn cold and sick — because too little pure blood is being sent to the extremities and internal organs.

Violent exertion may cause breathlessness or fainting; the heart muscle is overdone and suddenly fails to contract properly. Here again people in good training can undertake feats which people whose heart muscle is flabby for want of steady exercise should never dream of. One cause of heart strain is where a girl is suddenly rushed beyond her capacity, in running to catch a train. She may catch the train and take years to recover.

The immediate treatment in all these cases is to give the heart as little work as possible. Anyone who is faint should be laid flat down, the feet and hands rubbed, and everything done to help the circulation. Half a teaspoonful of salvolatile when she regains consciousness will help the heart. A girl who completely loses breath when running or playing games should not be allowed to go on that day. She should rest till she is all right and go quietly home, and a doctor must be consulted before she plays again. If a girl feels faint in church or any crowded room, she had better stoop down and pick up something, as this will help to send the blood to the head.

Rheumatic fever often seriously affects the heart, and any girl who has had it must take life easily for some time afterwards. Scarlet fever, diphtheria, and influenza may also leave bad after-effects.

Indigestion may cause palpitation and discomfort in the region of the heart, though the heart itself is sound enough.

Children with heart trouble will tell you that things go black, or that everything drifts away. They are easily frightened and bewildered, and often suffer from night terrors. Wherever there is the smallest reason to suspect anything of the kind, medical aid should be sought as soon as possible, and the advice given rigidly adhered to.

Varicose veins—where the veins of the leg become large and swollen they should be attended to by a doctor. They occur in people who have to stand a great deal, and cause intense aching. The best way to avoid them, is by keeping the circulation in thoroughly good order, and avoiding *unnecessary* standing. Women and girls are apt to stand when they might just as well be "off their feet."

This is not a book on First Aid, but from what has been said it is evident that when a girl cuts herself badly the continued bleeding is due to the heart's pumping. Fainting is Nature's ways of stopping the bleeding, and in no case should brandy or alcohol of any kind be given, as that increases the heart's action, and so will increase the flow of blood. Everyone should know enough first-aid to apply pressure properly in case of bleeding. At such a time running to look up a book will not be of the smallest use. You should know beforehand what to do.

CHAPTER VII.

SKIN.

We all know what the skin is, and we are all more or less apt to abuse it, for in our town-loving age it is troublesome to keep and easy to spoil.

If we could look down through the skin, we should find, on the outside, layers of horny scales, thickest in places where we constantly press, such as the soles of the feet, thinnest where it passes into the mouth, nose, and other openings of the body. These surface layers are being constantly worn away, and immediately below them is a second layer which is always busy at work making new scales to replace the worn ones. This layer is very sensitive to light, and in bright sunshine parts of it become more or less tanned, and so protect the true skin or dermis which lies underneath. When anyone cannot make this protecting colour, her under skin becomes scorched and sore, when exposed to too strong sunshine. Such people have to wear veils or put face cream on to take the place of the colour layer. In other people the protecting colour is found only in spots—*i.e.*, they freckle.

The horny layer and that just beneath it together make up the epidermis. Where they are very thick a girl will always look pale, however well; where thin, she

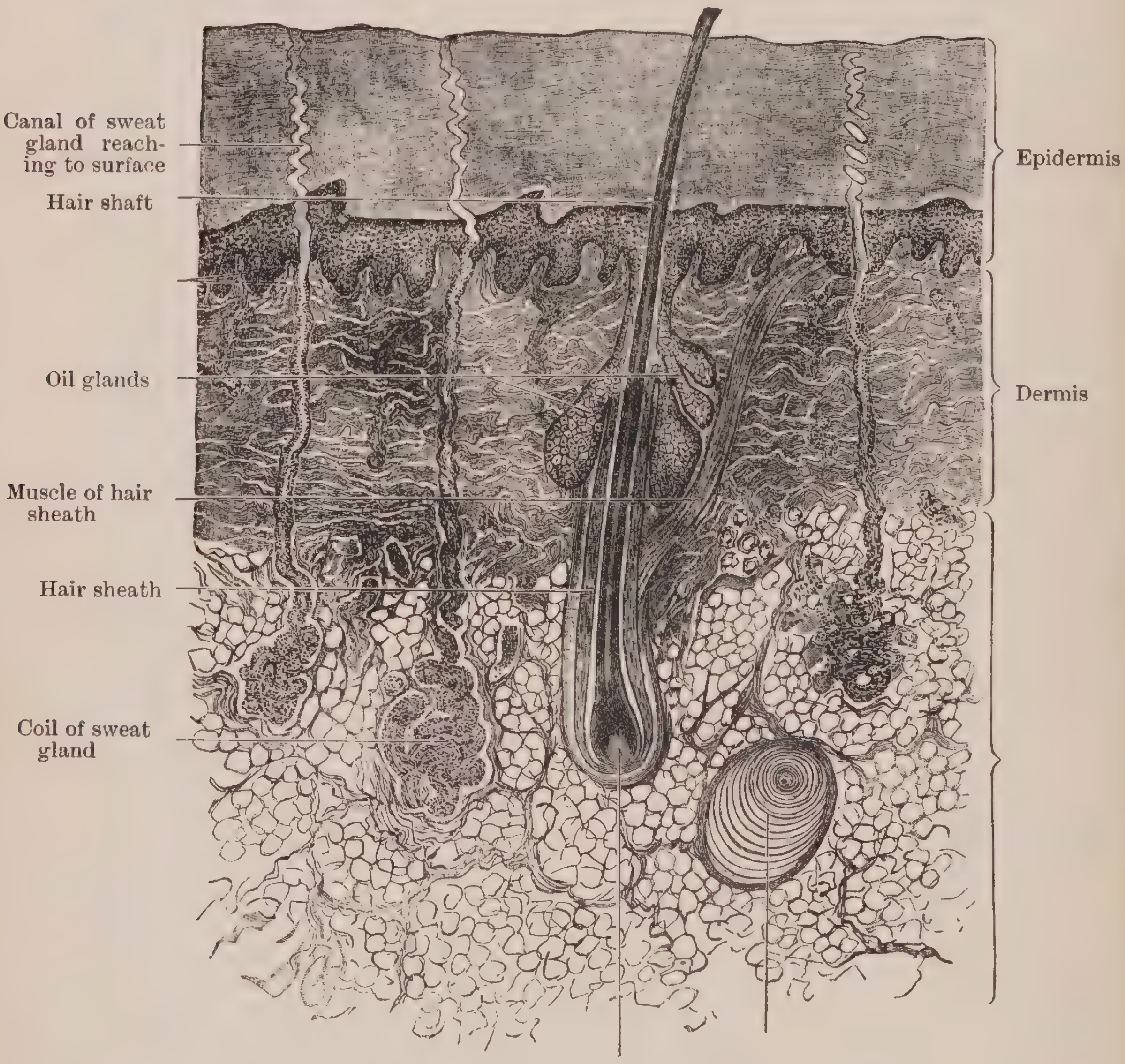
Canal of sweat gland reaching to surface
Hair shaft
Oil glands
Muscle of hair sheath
Hair sheath
Coil of sweat gland
Epidermis
Dermis
Point at the root of hair where growth takes place

FIG. 12.—Section through the skin.

will be rosy even when ill, so it does not always follow that a pale child is delicate, or one with bright colour robust. It is a question of how much the underlying blood vessels shine through the outer skin. You can run a needle through the epidermis or pick it off, and it neither bleeds nor hurts, for there are no blood vessels

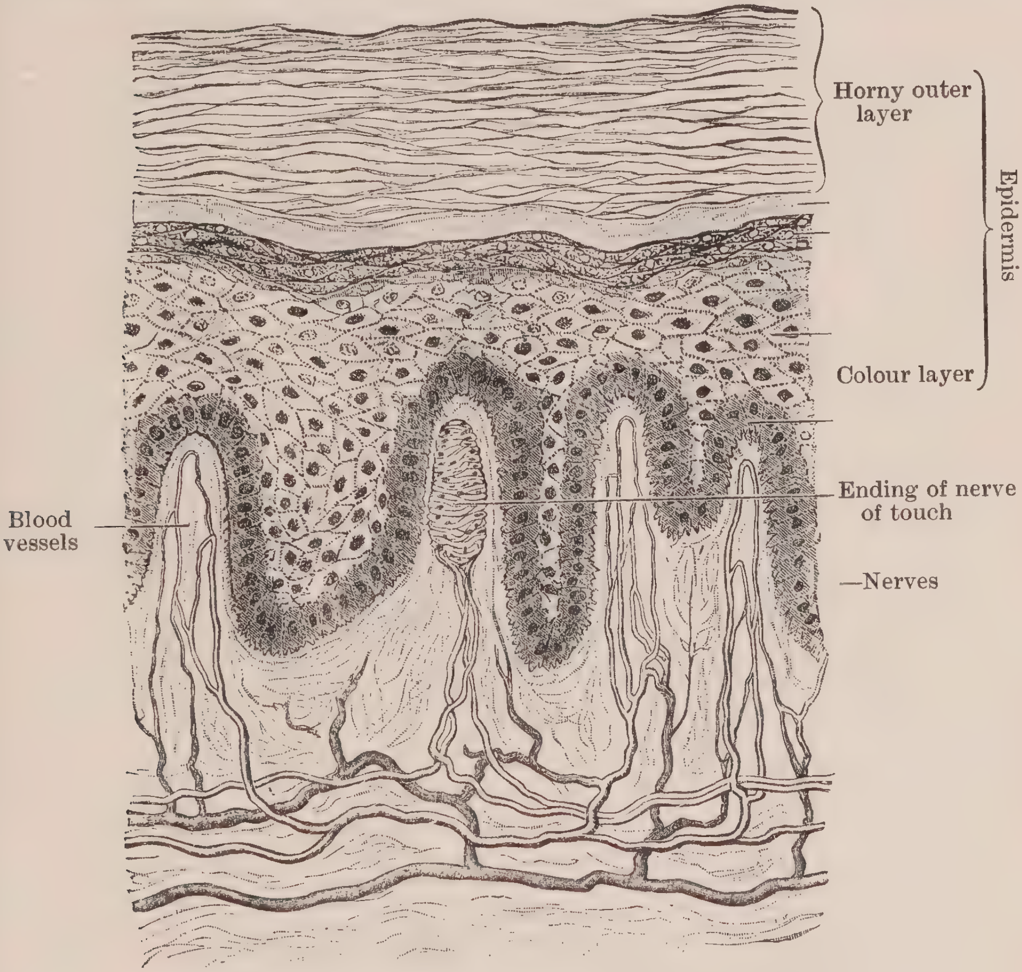

Fig. 13.—Section of the skin more highly magnified.

or nerves there, but the moment your needle goes farther, or you pull the skin off just a little deeper down, you draw blood and feel pain. You have reached the dermis or true skin.

The true skin consists of nerves,—each ending in a tiny knob just below the epidermis,—and fine blood vessels, and glands; these nerves, blood vessels, and glands are packed in their places by a quantity of elastic tissue and a number of fat cells: if the elastic tissue loses tone, or the fat cells are empty and flabby, the skin will fall into wrinkles, instead of being firmly stretched and well padded.

Running from the deepest layers of the dermis are the sweat glands, very tiny tubes which open on the surface. You can see the openings of the sweat glands on the ridges of skin on the palm of the hand, or those on the upper lip, when a child is very hot. The glands are largest under the arm and inside the elbow and knee joints. There are most of them in the palm of the hand and sole of the foot, fewest in the back and neck. As the little tube passes down into the dermis, it becomes twisted up into a round knot, with numbers of very thin-walled blood vessels surrounding it.

The sweat glands have two extremely important pieces of work to do:

1. They get rid of waste matter.
2. They help to keep the body at an even temperature.

Excretion of waste matter.—If you have been running hard on a warm day, and then put your tongue to your lips, you find there is a salt taste. The sweat glands have not been excreting water only, but other waste substances. The little blood vessels lying round the coil of the sweat gland have very thin walls, and water laden with waste matter oozes through these walls, and is taken in by the sweat gland. As the tube is open to the air at the top, the water will be constantly evaporating and so making room for more. When the sweat gland is very active, and more water is being passed into it than it can get rid of by evaporation, the tube will overflow at the opening, and we get beads of perspiration.

If the skin is to be kept healthy, the sweat glands must be in good working order. Girls keep themselves well in this way by plenty of active exercise and cold baths.

When a girl runs or takes any active exercise, the heart beats more quickly, and the little blood vessels round the sweat gland coil dilate so as to allow more blood to pass through; the result is she gets red and perspires — that is, the sweat glands have to work their hardest. All games, drill, and dancing are helpful in this way. Cold baths have to some extent the same effect as exercise. The shock of the cold water first causes the blood vessels in the skin to contract; then reaction sets in, the heart beats quickly, the vessels round the sweat gland coils dilate, and you feel in a glow, just as if you had been running. Hard rubbing helps to bring the blood back to the surface. But where a girl feels nothing of this warmth after a cold bath and a hard rub, it is perfectly useless for her to take it, and can only harm her. There is no value in the cold, it is the reaction which follows which dilates the vessels and sets the sweat glands working.

(By beginning with a tepid bath, and gradually taking it colder each morning, some girls can get used to a quite cold one. Another good plan where a cold bath is impossible, is to stand in warm water and sponge the body rapidly with cold. If all these are impossible, a good rub down with a rough towel every morning is the best substitute.) Sea bathing acts as cold baths do. The proper time for both is just before a meal, as heat is lost to the cold water, and is best replaced by food. Girls who take cold baths in the morning should never be allowed to wait a long time for breakfast, or at least they should have something warm to drink, especially in the winter.

In all air except that of the absolute country or sea, there is a great deal of fine dust or soot. The result is that our hands and faces get "dirty" even when we are doing nothing. The sweat glands are not the only ones in the skin; there are oil glands also, whose work is to supply enough oil to keep the skin layers from getting hard and cracked. (We all know that when we finger glass or delicate fabrics, we may leave greasy marks on them.) If we do not wish to become very unpleasant to other people, the oil from these glands and the stale perspiration on the surface must be got rid of, and the best way to do this is with soap and hot soft water: cold water is not nearly so effective, as it does not carry away the grease. Hard water must be softened before it will cleanse: till it is soft, the soap will not lather, but only make a curd. Soap, soda, and ammonia are all water softeners, but they tend also to dissolve away the natural oil in the skin, leaving it too dry. Hence any soap used for washing the skin should be super-fatted. People whose hands are constantly in soap and water (or soda) make their skin rough and dry. The best time for washing with hot water is last thing at night; special care must be taken to wash feet, armpits, and private parts, and this must be done every day. If the whole skin is not kept clean, the odour of stale perspiration from clothes and skin is objectionable. Too many hot baths are not good for anyone, and girls should not spend much time in them, as they make the heart and all other muscles weak and flabby. A short hot bath is of course the most effective and easiest way of cleansing. After active exercise a hot bath prevents stiffness by helping the body to get rid of waste products.[1]

Bath towels should be rough, as friction helps to bring the blood to the surface, and they should be big enough to allow a girl to dry quickly and all at once. The real reason why people are apt to shirk water is that they dislike the discomfort and cold of small half-damp towels to dry with. Big towels cost more, but they last longer.

Another very important factor in keeping the skin clean is frequent change of clothing. Wool is best worn next the skin, as it will absorb the perspiration, and a fluffy garment is better than a smooth. The periods of changing will differ in different cases. A girl who perspires much should change her under-linen at least twice a week; for others, once is enough. For obvious reasons it is necessary to change more frequently in summer than winter.

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[1] See chapter on "Physical Development."

Regulation of temperature.—Besides getting rid of waste matters the skin has also to keep the body at an even temperature. Whenever water or any other liquid evaporates, heat is taken from the surface on which it is lying. We see this in the case of eau-de-Cologne, for we all know that if it is dropped on the skin, and then the part is fanned, that place becomes cool. Menthol and lavender water act in the same way—they cool the skin, because they evaporate quickly from it, and in so doing withdraw part of its heat. Now what these things do so rapidly that we *feel* the change, perspiration does slowly.

Whenever we take exercise, or work hard, or get excited, heat is set free in the body, but whether this heat is retained or given out will depend partly on the action of the sweat glands. When a girl is running or dancing, heat is set free in the body, but as she begins to perspire, she loses it by evaporation from the skin. The size of the blood vessels which pass water into the sweat glands is so governed by the nerves that our own temperature remains much the same, whether taking exercise or keeping still, and whether we live in the tropics or in an English winter—in the one case we perspire a great deal and so get rid of quantities of heat, in the other we perspire little and keep our heat—this explains why we drink more in summer than in winter, and why we are thirsty after exercise. We have been losing a quantity of water in evaporation from the skin.

Heat is not lost from the skin by evaporation only. If you put a hot plate in cool air it cools, and the colder the air the faster will the plate pass its heat out into it. In the same way, heat is "conducted" from the skin when we are in a temperature cooler than our bodies. Unlike the plate, we are usually able by active exercise to obtain fresh heat as fast as we lose it.

Chills.—When a girl is losing heat faster than she is setting it free, she feels chilled. Suppose you have been playing a hard game of hockey—almost as fast as heat is set free, you lose it by perspiring. Now, when you stop running and stand still or sit down, you also stop liberating much heat, but your skin is still covered with perspiration, and very likely your clothes are wet with it. If you put on a thick coat at once, you prevent this perspiration from evaporating so fast, and you lose less heat; if you run home quickly, you go on setting heat free to balance what you are losing, but if you neither put on a coat nor keep on running, you will lose more heat than you can afford, and begin to shiver.

A draught always helps evaporation, so we hang clothes in the wind to dry. If you are perspiring, and stand about in the wind or drive off in a motor with no coat on, you will expect to be chilled. Getting wet never hurt anyone, but staying still in wet clothes has killed regiments. The water from the clothes evaporates, and as it does so, draws heat from your body, while you are doing nothing to replace it. Exactly the same thing happens when you sleep in a damp bed.

"Mother says I mustn't go up to the field, for I always catch cold," or, "Mother says she is afraid I'll get wet," are messages I have heard more than once. And no wonder Mother says so! "I" go up in a cotton blouse, and run about hard, then I stand to have a little chat or to watch the other girls playing, and then I dawdle home with a friend. I go into a house (where there are sure to be various microbes lurking) very tired, and have a sore throat next morning. Many games-mistresses insist on the decencies of life in the shape of knickerbockers for the field; it is equally necessary to see that, when possible, girls play in woollen tops, and that in any case they have a warm coat or jersey to put on directly they stop.

The best way to avoid chill is to wear wool next the skin, or if you cannot afford wool, some loosely woven material; for wool and still air are both bad heat conductors—that is to say, heat only passes through them slowly. When we want to keep ice, we wrap it in flannel, that the heat outside may only pass slowly into it; and in the same way, the heat from our bodies will pass slowly through a woollen garment. Of course there is no warmth in the wool itself, what it does is to help us to keep our heat to ourselves, instead of allowing it to pass away. A loosely woven garment keeps in heat better than a smooth one, because air gets entangled in the spaces. Two garments are warmer than one of equal thickness, because of the layer of still air between. Flannelette is really warmer than calico for this reason, but its fluffiness makes it most dangerous, as it so easily catches fire. Girls at school should be forbidden flannelette dressing-gowns; it is impossible to veto the material altogether, while there are so many people too poor to buy wool, and who suffer from the cold. Knitted woollen vests with long sleeves are most suitable for girls who cannot afford expensive underclothes.

Whenever heat has been lost, a girl has used up a good deal of her food reserve, so the second way to avoid being chilled is to make sure that she does not go too long without a meal after games or any violent exercise. Many of us know how nice hot soup is after a dance!

The ideal arrangement in boarding-schools is for girls to play games in their gymnasium dresses and go straight back to the house to change and have tea before doing anything else. The reason why it is so important to guard against chill is that it always lowers a girl's power of resistance, and makes her an easy prey to any microbe she meets when she gets back to the house.

Fever may be due to very widely differing causes, which the doctor only can decide upon; it is not in itself a disease, but the result of one.[1] Where heat is set free in the body too fast and the skin fails to perspire enough to restore the balance, you say that a person has fever. The only safe way of knowing this is by taking the temperature. In health this should be 98·4, and it will not vary more than a degree the whole day. The temperature is usually taken either under the tongue with the mouth closed, or by putting the bulb of the thermometer in the arm-pit; it should always be taken in the same place, and at the same time of day. The thermometer should then be shaken down and put in disinfectant. In fever the temperature is usually high at night and falls in the morning. When a girl is feverish her pulse and breathing are quick, she does not want to eat but is very thirsty, and is often constipated. Shivering and headache are also signs of fever.

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[1] The fever which occurs at the beginning of many infectious diseases is probably curative, as large quantities of heat may be required when antitoxins are being formed. It is certain that as soon as sufficient antitoxins are present, the temperature comes down with a run and the "crisis" is over (see "Infectious Diseases").

Since excitement, work, and exercise all tend to increase the quantity of heat liberated in the body, the treatment for fever must include quiet and rest in bed. A girl with a temperature must stay in bed until it goes down and keeps down. Indigestion is one of the commoner causes in children, and only light, easily digested food should be given. Milk and soda water, or barley water, help to quench thirst.

Where the temperature rises above 100°, cold sponging is a relief.

Sometimes drugs are given to help the skin to perspire more freely, and to increase the action of the kidneys.

Quiet does not mean solitude. In some schools girls are left far too severely alone when ill; an active-brained girl may fret herself into a still higher fever if left alone, and forbidden to read. Feverish children are not generally sensible, and a great deal of tact and kindness is needed in looking after them.

When the temperature falls it leaves a girl weak, and she will need plenty of warmth and feeding up.

This section may be finished by summing up in few words what it has taken a long time to explain.

The skin gets rid of waste matter, so help it by taking plenty of exercise and keeping clean.

To avoid being chilled wear suitable underclothes which absorb moisture and conduct heat slowly.

Put on a coat after violent exercise.

Don't stand about in a draught when hot.

Never stand about in wet clothes or sleep in a damp bed.

The normal temperature is 98·4.

To get rid of fever remove the cause, keep quiet, and rest both body and mind.

Girls are apt to suffer from slight skin troubles which are tiresome and disfiguring.

1. "*Dry skin*," "*chaps.*"—A dry, cracked skin is due to lack of lubrication from the little glands in the skin. It occurs in cold weather, when the skin is blanched and in consequence very little blood is flowing to the oil glands.

To prevent this, the skin can be rubbed with glycerine and rose water after washing in cold weather. At night some ointment such as cold cream should be applied. Before going out into a cold wind the skin should be protected by some invisible ointment, such as hazeline snow or icilma, or by a veil.

2. *Excessive perspiration.*—A cold, clammy skin is often a sign of ill-health and malnutrition. If sweating

occurs, particularly at night and for no apparent reason, a doctor should be consulted.

Sweating of the feet troubles some people who are otherwise in perfect health. Frequent washing and a powder of boracic and starch in equal parts alleviates this.

3. *Blackheads.*—The oil glands are blocked. A super-fatted soap, such as Gibb's cold cream soap, should be rubbed into the skin. At night cold cream should be applied and taken off with lint in the morning. Ointments have a cleansing effect. In obstinate cases the blackheads can be steamed by means of a bronchitis kettle. Sometimes the general health requires attention.

4. *Acne.*—This trouble means that the oil glands have become infected with bacteria and form little abscesses. These little abscesses should be opened and the skin steamed. The treatment is the same as for blackheads, but if the trouble becomes very obstinate a vaccine may be required.

5. *Whitlow.*—This is what is popularly termed a gathering. It should be opened and dressed with antiseptic gauze.

6. *Warts* can be treated with carbon-dioxide snow or excised by a doctor.

7. *Moles* can only be cured by removal.

8. *Pimples* are usually due to want of cleanliness or a faulty digestion. A girl who suffers in this way should be careful to wash thoroughly and to avoid constipation.

9. *Ringworm.*—Red circles or parts of circles appear on the skin. White precipitate ointment sometimes cures the trouble, which is due to the growth of a small parasite, and very contagious. The ointment is poisonous and must not be left about.

10. *Parasites, scabies, or itch.*—This occurs in dirty children, and is often found on the web between the fingers. Little can be seen with the naked eye but small black particles and evidence of scratching, but with a magnifying glass the parasite can be detected.

To get rid of scabies—boil the clothes, give the child a hot bath with a lavish allowance of sulphur soap, followed by the application of sulphur ointment.

11. *Lice.*—These are found on dirty children who, of course, may infect other nicely kept children. They give rise to severe irritation. Along the seam of the garment which is worn next to the skin the parasite is to be found. It can be seen with the naked eye, but a magnifying glass often helps its detection.

As in scabies—boil the clothes. Wash the child all over with some disinfectant soap and water. Then let the skin be lightly rubbed with sassafras oil or staphysagria ointment. Reinfection is prevented by attention to cleanliness.

12. *Frost-bite.*—The mildest form of frost-bite is the chilblain. This occurs in girls who have poor circulations.

The way to prevent *chilblains* is to improve the circulation by cold baths, exercise, good food, and suitable clothes. Once the chilblain has occurred, paint it with "new skin" or collodion and wrap the part in cotton wool.

13. *Burns.*—These vary in degree from the slight redness of sunburn to destruction of the tissues. When the skin has been badly burnt the raw place should be painted with 2 per cent. iodine and covered up with antiseptic gauze.

14. *Scalds.*—Prick the blister. Cover it up with antiseptic gauze so as to exclude air as far as possible.

15. *Wounds.*—The skin protects the body from attacks by bacteria and other hurtful microbes, and you can touch poisons without danger so long as it is intact. If this protective covering is scratched or scraped, microbes or poisons find a free entrance to the body. Hence cuts and scrapes should be covered up with a disinfectant and kept *absolutely* clean. (Water without a disinfectant may be full of germs.) The most useful dressing is a piece of boric lint.

Any raw surface such as a spot which has been scratched must be treated in the same way. If it is touched or fingered, blood-poisoning may result.

If a dressing sticks to a wound it should never be pulled or dragged in any way. Soak the part in warm water till the lint comes away quite easily. The same applies to getting any "scab" formed off the skin.

EXCRETION.

As we have already seen, a great deal of the waste matter of the body is either got rid of in solid form from the food canal or given off by the skin. As, however, evaporation from the skin will depend on many circumstances, the body must have another machine for getting rid of the matter which sometimes

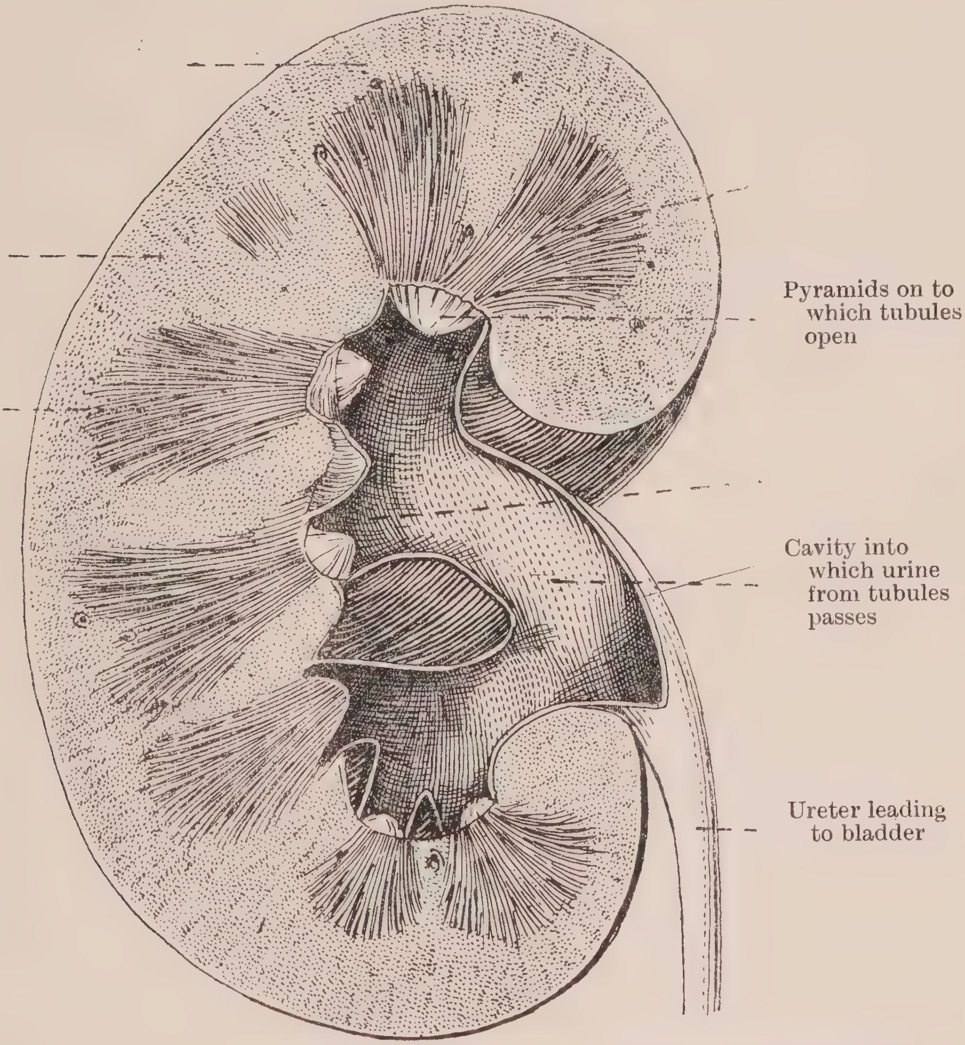
Pyramids on to which tubules open
Cavity into which urine from tubules passes
Ureter leading to bladder

Fig. 14.—Kidney cut in half, showing how the mass of tubules of which it is composed open into a cavity leading to the ureter.

passes out of the sweat glands. This machine consists of the kidneys and bladder.

The kidneys are two small bodies lying one on each side of the backbone low down in the body. Each is built up of a number of very minute coiled tubes not unlike the sweat glands. Each tube is in close contact with blood vessels, which constantly pass into it the water and dissolved waste matter which they carry from the liver and other internal organs. The liquid from the tubules of each kidney is all collected into two long, narrow tubes or ureters, one running from the right kidney, the other from the left. Both ureters open into the bladder, which opens to the exterior. The liquid, water, or urine is constantly trickling down into the bladder. When it is full the muscle which keeps the exterior opening shut relaxes, and the urine is got rid of. This action can be delayed for a time by an effort of will, but girls should be taught that it is a bad thing to get into the way of putting off seeking relief till they cannot help doing so.

When there is pain on getting rid of the urine, medical aid should *always* be sought. Hot fomentations will give temporary relief. The case where girls cannot control the muscle which keeps the bladder closed has been dealt with under "Bad Habits."

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CHAPTER VIII.

THE TEETH.

At 6 months old a child begins to cut her teeth. The first teeth to appear are the central incisors or cutting teeth, then the lateral incisors, then the conical canine or dog teeth, then the two molars or grinding teeth.

At 6 years or thereabouts the milk teeth grow loose and come out, and the permanent teeth begin to take their place. There are thirty-two permanent teeth, eight incisors, four canine, eight bicuspids, and twelve molars.

The first of the permanent teeth to appear is a molar, and the last is a molar, which is also called the wisdom tooth. It appears when a girl is about 18 years old.

Cutting the teeth, both milk teeth and permanent, may be accompanied by irritability of temper and pain at the root of the tooth.

Structure of a tooth.—A tooth consists of a crown, a neck, and one or more fangs.

The crown is the part protruding beyond the gum.

The fang is the root of the tooth which penetrates the jaw-bone.

The neck is the constricted part between the two.

A section through a tooth shows the central pulp

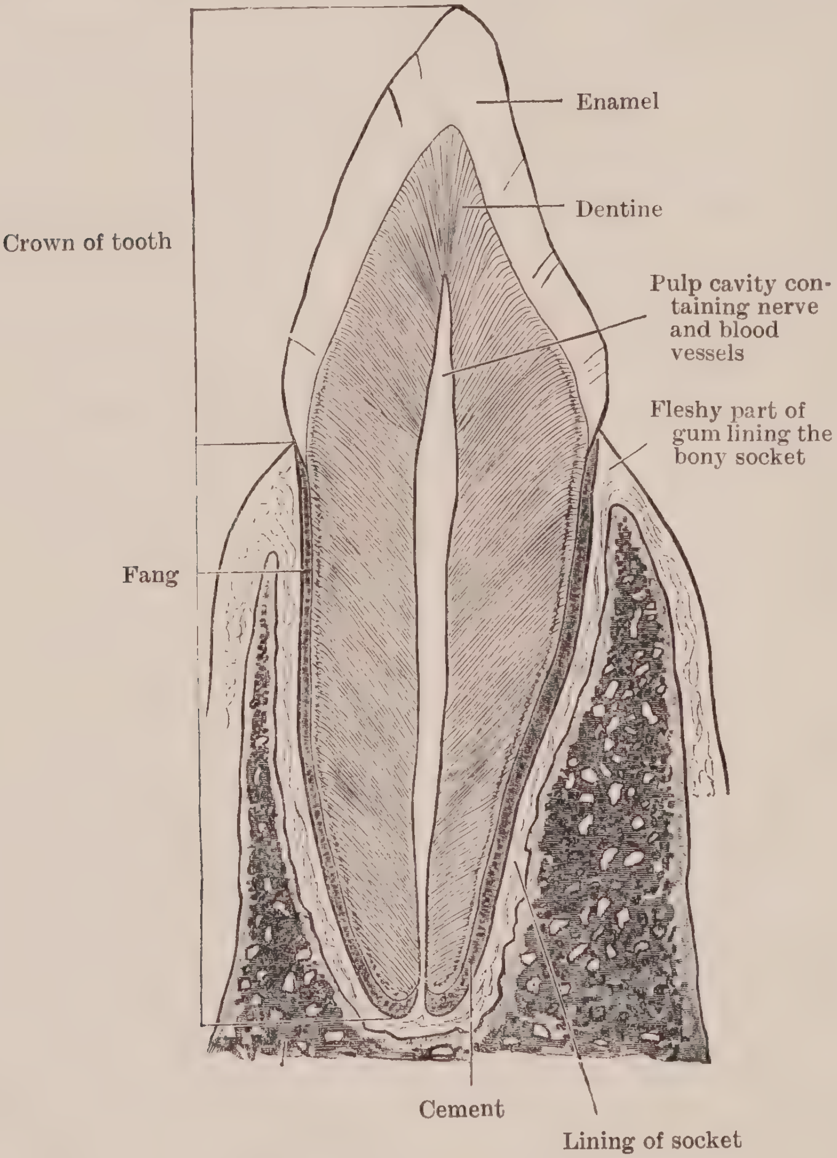
Enamel
Dentine
Crown of tooth
Pulp cavity containing nerve and blood vessels
Fleshy part of gum lining the bony socket
Fang
Cement
Lining of socket

FIG. 15.—Section taken through tooth and gum to show their structure.

cavity in which are embedded the blood vessels and nerves (see diagram).

Surrounding this is a hard wall of cement. The cement at the crown of the tooth is covered by enamel, and at the fang of the tooth is covered by dentine.

Care of the teeth and gums.—From birth the mouth should always have careful attention.

A piece of old soft linen dipped in glycerine and borax should be gently rubbed round a baby's gums night and morning.

As soon as the teeth appear a little tooth brush should be used.

The brush should be one from which the bristles will not come out and should be kept scrupulously clean.

Soap is an excellent thing to use with the brush.

The O.S. dental tablet is recommended by more than one medical man of experience.

The following prescription is considered a perfect tooth powder. It is not too hard. It is sufficiently alkaline. It is cleansing:—

Pulv. Sapo. Hisp.	ʒ iii.
Pulv. Iridis	gr. 112.
Mag. Carb. Pond.	āā ʒ iss.
Cret. Precep.	
Sod. Bibor.	gr. 112.
Menthol	gr. xviii.

Fiat Dentif.

Some children dislike the taste of menthol in the prescription. If so, that can be omitted.

If powder is used, it should be slightly alkaline. No acid should be allowed, as acid tends to act on the enamel of the teeth, dissolving it and allowing the entrance of bacteria.

Instead of using powder, some dentists advise that children's teeth should be brushed twice a day with a weak solution of carbonate of soda.

Others advocate using a tumbler of water in which one crystal of potassium permanganate has been dissolved. This is an antiseptic—but it must be used carefully, as it stains clothing.

Weak sanitas, weak listerine, are good mouth washes; the best of all is weak peroxide of hydrogen—it has, however, the disadvantage of expense.

In cases of acid dyspepsia, where the teeth are decaying, milk of magnesia should be held in the mouth for several minutes night and morning.

Foods.—Hard foods which need biting and tearing and chewing help to make the teeth strong and develop the jaws.

Hard biscuits, toast, crusts, roast meat and grilled meat (not minced meat), oaten biscuits, rusks, firm apples, and pears are things which give the teeth work to do and develop them.

Soft, pulpy foods are of no use to the teeth.

Food containing acids, such as pickles, "soused herrings," oranges, lemons, and salads with vinegar, of course tend to corrode the teeth. But cleansing the teeth with a brush and some alkaline soap after a meal easily counteracts this.

It is a good thing to finish a meal with a hard biscuit or crust, and finally with a drink of water, so that no soft, pulpy food is left about the teeth.

The teeth should be brushed at least twice a day—after breakfast and after the last meal at night. It is a wicked habit to give children chocolates or biscuits after they are tucked up in bed.

Irregularity, malformation.—A severe illness in a small child may affect the teeth, which have not yet come through. Rickets, marasmus, scurvy, all leave their mark, and show that the teeth have suffered from malnutrition.

Irregularity of the teeth in their eruption may occur from injury. Sometimes one cannot account for it. The best way to treat irregularity is by manipulation. Try and press the teeth into place with the fingers morning and night when the teeth are brushed.

In bad cases a plate may be necessary, but most careful attention must be given to the cleanliness of the plate, otherwise the teeth decay.

Caries or decay.—A little food is left against a tooth. Fermentation in that food particle forms an acid. The acid corrodes the enamel on the tooth, and an entrance is made for the microbes. When a little black point of caries is seen on a first tooth, and it usually occurs on a molar, it is advisable to have that tooth out or stopped. It is also advisable to find out the cause of the caries and prevent other teeth from suffering.

If one of the permanent teeth is decayed, then it is better to have it "stopped," and the hygiene of the mouth should be attended to to prevent further trouble.

Gumboil.—A local swelling in the jaw, perhaps the size of a small nut, accompanied by throbbing and toothache, is known as a gumboil.

It is an abscess caused by a decayed tooth.

The child should be allowed to rinse her mouth with hot, weak listerine or sanitas.

The quickest treatment is to have the abscess opened, let the mouth wash be used continually, and when the swelling has gone down have the decayed tooth stopped or removed.

Swellings in the jaw.—A swelling of the jaw, which grows slowly and gives little or no pain, should be seen by a medical man. It may, or it may not, be serious.

TROUBLES OF THE GUMS.

Stomatitis.—This is an inflammatory condition of the mouth common in children of tender years. It may occur later on, if the mouth is not well attended to, or the resisting power is low. The mouth feels sore and little white spots appear.

The treatment is to rinse the mouth with slightly alkaline antiseptic solution, *e.g.* weak permanganate of potash, and attend to the general health.

Pale gums.—Pale gums point to anæmia. Here again the general health must be improved.

Spongy gums.—Children should learn to sleep with their mouths shut, otherwise they wake up and find the teeth and gums dry and not bathed with the natural alkaline saliva as they should be. This leads to a spongy unhealthy condition of the gums, which will bleed easily.

The treatment is, of course, to remove the nasal obstruction and then teach the child to breathe through the nose.

Scurvy, which is rarely seen now, also causes this unhealthy condition of the gums. The cause is lack of the fresh element in food. It is soon cured by giving the child fresh fruit, such as oranges and lemon juice, and also, if possible, fresh meat.

If the spongy gums are accompanied by decayed teeth, and if both of these troubles are neglected, one may expect to get the conditions known as pyorrhœa, or matter oozing from the spongy gums. This is a very common trouble, easily noticeable in adults, whereas it probably began, and should have been prevented, during school years.

Preventive treatment is breathing with the mouth shut, and attending to the hygiene of the teeth.

Later, treatment consists in extraction of the worst teeth, stopping the others, and treating the gums with weak antiseptics, such as peroxide of hydrogen and astringents such as alum.

Trouble caused by Decayed Teeth and Spongy Gums.

Neuralgia.—Ninety-nine per cent. of cases of neuralgia are due to decayed teeth. The pain may be in the ear, in the cheek, in the forehead, at the back of the neck, but the trouble is in the teeth nearly always.

Röntgen rays will sometimes show the trouble when the naked eye cannot.

The treatment for all neuralgia is to have the mouth and teeth put in a healthy condition. If the neuralgia continues, a further cause must be sought.

NEURITIS AND SCIATICA.—Neuritis is pain along the course of a nerve and tenderness in that part on pressure. Sciatica is neuritis along the sciatic nerve.

Neuritis is due to a poison circulating in the system, and in many cases that poison is from a tooth.

A Cambridge Blue had to give up rowing owing to severe attacks of sciatica. Everything possible was done for this sciatica without avail. It was impossible for him to continue rowing. Eventually he had a tooth out. The crown was perfectly sound, but there was an abscess at the root of it. There has since been no sciatica.

A man of commerce was very troubled by neuritis in his left arm. Whenever he had much worry the neuritis recurred, and so severely that he had to abandon "worrying" schemes. He went to see a dentist, who recommended that one tooth where there was a pocket of pus should come out, and that a weak solution of peroxide of hydrogen should be used as a mouth wash. The neuritis has now vanished, and the merchant can indulge in his worrying schemes with impunity.

Osteo-arthritis, chronic rheumatism, gout.—Dr. Stocker Harris of Esher tells me that since he took to examining the teeth and seeing that the hygiene of the mouth was perfect, gout and rheumatism have vanished from his practice.

"Gout" and "chronic rheumatism" are commonly due to a poison from the teeth circulating in the blood.

If there is one joint especially weak from previous injury or strain, the poison attacks that, and there results a rheumatic tennis elbow or a hockey knee. If there is no especially weak joint, then the poison attacks the joint where the circulation is at the lowest ebb, namely, the big toe; and often it attacks it when the whole circulation is at its weakest, namely, at two in the morning.

But if one cures the pyorrhœa and decayed teeth by *peroxide of hydrogen* the trouble vanishes.

A lady came up from Exeter to see a surgeon, with pain in her foot. The pain was so severe that she would have to stand still until it was better, when she was out walking. She was very surprised to hear that her trouble was due to teeth. And both she and her friends seemed astonished when not only did the foot get better, but her general health improved after the teeth and gums had been put right.

Similarly, neurasthenia, which is so often attributed to overwork, is in many cases entirely due to the unhealthy condition of the gums and the teeth.

To misquote the poet, but to right the world, one might add that—More ills are wrought by teeth than this world dreams of; and it is during schooldays that these troubles begin and should be prevented.

CHAPTER IX.

THE HAIR AND NAILS.

EACH hair consists of a root or follicle and a stem which projects beyond the skin. Nourishment is supplied by little blood vessels to the follicle, and by the glands which open on to the stem of the hair, and which secrete oily lubricating matter. A little muscle runs from the hair sheath to the skin; when this contracts we get the condition of goose skin. This also has probably given rise to the expression, "hair standing on end," for, by its contraction, the muscle erects the hair. This can easily be understood by studying the diagram.

Care of the hair.—The hair, like everything else, is nourished by the blood stream, and thus anything which affects the general health may affect it. A long, serious illness, which leaves the body in a weak, impoverished state, often causes the hair to fall out. Girls who are anæmic (*i.e.* wanting in red blood corpuscles) are sometimes bothered by this trouble. The remedy is, of course, to build up the general health in the usual way with fresh air, sunlight, good food, exercise, ample sleep, and perhaps an iron tonic. Lately a girl who had had pneumonia came to me to ask if she had better brush her hair less. "It comes out in handfuls whenever I touch it," she said. I told her it was far better to brush it out—that loose hair was really dead, and was better out of the way, rather than crowding up the new hairs which were beginning to grow.

Brushing the hair does good in several ways. It gets rid of the dead and dying hairs which take up space; it stimulates the little oil glands, making them work to keep the hair glossy, and, like all rubbing, it causes the surface blood vessels to dilate, and so helps to keep the hair well nourished. Massaging the skin of the scalp with the finger-tips has much the same effect as brushing, but does not get rid of dust and loose hairs.

Combing gets rid of tangles and dust. If you have been near dirty people, in schools, hospitals, or in the train, it is wise to comb the hair through with a fine tooth comb afterwards.

In some people the oil glands are not very active and the hair is "dry." Very often thorough brushing twice a day will cause the glands to work and keep it bright and glossy. If this is not enough, it can be brushed with a little oil, but it is always better if possible to make the body do its own work, as the more we do the glands' work for them, the less they will do for themselves! When the hair is very dry, it should not be washed too often; every three weeks to a month is enough; strong alkalies such as ammonia, or very alkaline soaps which remove all the oil, are better not used, or only very sparingly.

In other people the oil glands work so hard that the hair is always greasy. Frequent washing with a little ammonia or soda in the water helps to get rid of the oil. Any hair wash that contains "spirit," methylated, benzol, paraffin, etc., will get rid of the grease by dissolving it, but all such preparations are apt to be dangerous as they are *very* inflammable. We know how methylated spirit flares up, and the effects of lighted brandy on plum pudding. Such spirituous lotions should never be used near a lighted candle, gas, or fire.

Generally speaking, the hair should be washed every one to three weeks with soft soap and soft water. Afterwards the scalp should be well rubbed with a rough towel.

Scurf or dandruff gives some people a great deal of trouble. Whitish dry particles appear on the scalp, each consisting of fatty oil matter and loose skin cells. It is thought to be due to the action of a small plant. A spirituous disinfectant lotion, such as eau-de-quinine, should be rubbed into the scalp twice a day.

Ringworm has been explained in the chapter on the skin. It is very infectious and may be passed on by hat, brush, or comb.

Parasites of the hair are very small insects which are apt to trouble people who live in dirty surroundings and are careless about their persons. They are very common among children, and are easily picked up in railway carriages, or cabs. Of course, they are disgusting, but no one need be afraid of this trouble if they keep the hair clean and use a tooth comb, especially if they feel any irritation. If allowed to remain in the hair, the insect lays eggs—"nits"—and so multiplies. To get rid of parasites, the hair should be well washed with "one in forty carbolic," or warm vinegar or dilute lysol, and regularly tooth combed. This treatment should be repeated till no trace of the trouble is left. Some doctors advise staphysagria ointment.

The Nail.

The nail is formed from the epidermis, and is an interesting index of health and habits. It takes six months to grow from the root to tip, and any severe illness is marked on it by a transverse depression. If it is in the middle of the nail, it will be three months since the patient had a serious illness.

Anæmia is shown by the little white flakes on the nail of which the fortune-tellers quote, "A friend, a foe, a journey to go."

Brittle nails are sometimes microbic in origin; white precipitate ointment can be applied at night. It is best to sleep in loose gloves.

Bitten nails are best treated by the application of burnt alum, and gloves may be worn at night.

Ingrowing toe-nails are due to the pressure of narrow boots. The surface of the nail should be well scraped so that it is never allowed to grow very thick.

If you have any trouble, paint the nail with weak caustic potash, and cut it straight across with a small V in the centre.

Bluish nails are found in people with weak circulations.

CHAPTER X.

MENSTRUATION.

For the first few years of life every girl's main concern is with herself; her body has to grow and develop so that it becomes fit for the work it may have to do; her senses to be trained in such a way that the world outside is no longer a "blank or blot, but means intensely"; the muscles quickened and strengthened to respond to the calls made on them. So far, the child is building for self. Then there comes adolescence, beginning about 12 to 14, ending at 25, the years during which she has to learn that her life is not hers only, and that what she has gained and holds is a trust for others who may come after her. We see the same law at work all through nature. A seed falls into the ground; it sends down roots and grows up, taking for itself all that it can get from earth and air and sunshine, and then when its own life is strong it spends its store in making seeds to carry on the race.

A plant or animal begins its life as a tiny transparent speck of protoplasm or cell, which has been formed from two cells—one male, the other female. After a time, as this double cell grows large, it divides and divides till a small ball of cells is found, and then certain cells are set aside for one purpose, others for others, till by degrees the perfect plant or animal is built up. From the very beginning certain little cells are set apart which will take no part in building up the body. These are the germ cells. They will lie inactive till they are set free to unite with another, and each to form in its turn a new plant or animal.

Most people know the big Fucus serratus, the large, flat, brown seaweeds which squelch under our feet when we scramble over the rocks. If we look at these plants carefully we find that they are all very much alike, but at the ends of the branches of one kind are bright orange spots, while in the other there are dark olive green. The reason is that this species of Fucus plant bears sometimes one kind of germ cell, sometimes another, never both kinds on the same plant. When we cut through one of the olive green spots and use a microscope, we find we have cut into a little open flask on the walls of which are small bladders, each containing eight round germ cells. When we do the same with the orange spots we find the same open flask, but this time it is lined with fine branching hairs, and every here and there is a tiny bladder full of germ cells so small that we must use a very strong microscope to see them.

When the germ cells of both plants are ripe, the small bladders which contain them are forced out of the flask into the sea water; the bladder bursts and the cells are set free. The large egg cells from the dark green spots are carried by the water; they have no means of moving themselves; but the tiny sperm cells have two little hairs, and lash their way through the water till they reach an egg cell. Only one can unite with each egg cell, and directly it has done so, the little speck will begin to grow and divide to build up a new plant. If the egg cell is not joined to the small "male" germ cell, it cannot form a new plant and will die away. In other plants the egg cell is in "seeds," the sperm cell in the pollen grain, and we know that if no pollen is brought to the seed it will wither and die.

Just as in Fucus, there is a mother plant bearing the egg cells, and a father plant bearing the sperm cells, so it is in animals, but when we look at what we call the higher animals, rabbits, mice, dogs, etc., we find very much more careful and beautiful arrangements than in the plant. The little egg cell is kept by the mother in a part of her body specially set aside for it. Here the father's sperm cell meets it, and then it may begin to grow day by day, fed by the mother, and kept safe by her, till it is ready to be born into the world and begin life on its own account.

We seem to have wandered a long way from the beginning of this chapter, but a girl who knows a little about plants and animals will find it much easier to understand herself, for life and the laws which govern it are in no muddle—one rule for us, another for plants, another for animals. We are not outside nature, but a part of it, and the great laws are the same for all. Even as the plants and animals then, every girl has a special part of her set aside, that when she marries she may have children as they do. We do not talk about it except with the people we know best of all and have most respect for, because love, birth, and death are the big things of life, and we cannot treat them with too much reverence. No girl can afford to think or speak lightly of them. Every girl must know something about them, and if she is really puzzled, she had far better ask the best woman she knows to explain.

This special part of the body is built up of the ovaries, the fallopian tubes, and the uterus. The ovaries are two small round masses in which the egg cells are found. They are about an inch long, and lie on the right and left side low down in the body. The fallopian tubes are narrow tubes which curve round the ovary rather like a shepherd's crook—each is open at the end next the ovary; at the other end each opens into the uterus or womb. This is a pear-shaped organ with the broad end uppermost. It is about two to three inches long, with walls of muscle lined with a fine membrane in which are mucous glands and blood vessels; in the centre is a small hollow space, and leading from this is a passage—the vagina—which opens to the exterior. The different parts are loosely held in place by strap-shaped bands and ligaments. So long as a girl is a child there is nothing to tell her that these parts are there at all, but when she is about 14 very great changes take place, and she begins to "grow up." The first signs of this are that the body becomes rounder and the hips larger. Sometimes she has a backache or pains in her chest, and because her brain is growing and changing very rapidly, she may feel dead tired and disinclined for lessons, or very irritable and easily upset. The organs we have just been considering begin to work, whereas up to now they have had nothing to do. One of the little envelopes which contains an egg cell ripens and bursts, and the egg cell passes from the ovary, down the fallopian tube to the uterus. At the same time, more blood than usual is sent to the soft mucous membrane lining the cavity of the uterus; the lining itself becomes soft, and some of the blood vessels are torn across. The blood passes down the passage leading from the uterus to the exterior, and with it the egg cell is passed away. The flow of blood may last from three to five days, sometimes longer, and the same thing happens every month till a woman becomes too old to be a mother. We know that when a girl marries the egg cell may be the beginning of a little new life; in that case it will not be passed away, but will be kept by its mother, fastened to the wall of the uterus so that it is really one with her. Here it will grow and change for nine months till the child is ready to be born into the world, and during this time the usual monthly periods will not happen.

Girls should always be told about this "menstruation" before it happens. Otherwise they may be very much frightened and think they have an illness. Of course, it is not an illness at all, but a regular function which is common to all healthy women and girls, and must never be interfered with. If a girl of about 12 is told about it by someone who understands her, she usually thinks little about it, and when it happens she knows what to expect, and is not startled just at the time when her nervous system is most unstable, and self-control most difficult.

Menstruation in this country usually begins at about 14 or 15, but in nervous, excitable girls it may happen much earlier—from 11 onwards. Such girls, when they get to about 11, should be encouraged to be much out of doors and rather kept from too much reading, especially of books with much love interest. If they begin to grow up too early they want a great deal of kindness and patience, for they are often such little children in other ways, and find the inevitable restrictions very hard. In tropical countries menstruation begins on an average about two years sooner than in England. In out-of-door girls who are apt to be tomboys it is often late. Such girls may be very tall, but they grow up slowly in other ways, and schoolmistresses may find them "lacking in responsibility." Until their bodies have developed, it is a mistake to treat this trait as a serious defect; sentiment or despondency over their faulty conduct is quite out of place!

As this hæmorrhage is a natural function, it is important that girls should neither check nor increase it. Violent exercise, such as running, jumping, or any very rapid movement, quickens the heart beat and rate of circulation, and so should be avoided. Moderate exercise is good. I always make girls who have *no* pain stop violent exercise for two to three days at least. A hot bath at the beginning of the period usually helps girls, and though at the time she must be especially careful about sponging, a whole bath is not advisable if there is any tendency to faint. Cold baths are better stopped as they may tend to check the flow. For the same reason a girl must be specially careful not to hang about in wet clothes or with damp feet. All chill must be guarded against.

TROUBLES CONNECTED WITH MENSTRUATION.

Although this function is a natural one, it is very liable to give trouble, especially during the growing years, and all girls require care and watching in this respect.

(1) The periods may cease altogether (amenorrhœa).

(2) The periods may be too frequent or excessive.

(3) They may be accompanied by considerable discomfort or actual pain.

(1) *Amenorrhœa.*—In some girls menstruation is very late; should it be delayed beyond 17 it is wise to consult a doctor, especially when a girl has discomfort at fixed intervals or suffers from nose bleeding, as there may be some organic fault. It cannot be too strongly insisted on that this is not a matter for lay interference, and no drugs should ever be given except in accordance with medical orders.

In other cases, especially where girls grow up young, the periods may be more or less irregular for a year or two. Should they cease altogether, the girl needs care, as it is often a sign of constitutional delicacy. In the majority of cases a good iron tonic and plenty of fresh air will help matters, as anæmia is often at the bottom of the trouble. Carefully graded Swedish exercises, riding, salt-water baths, and a diet with plenty of fresh meat are all useful, and any tendency to chest weakness should be watched and guarded against. In boarding schools it is best for the matron to keep sanitary towels for the girls, which should be collected and burnt after use. In this way it is easy to keep count of any marked inequality without "worrying" the girls. In a day school I think the method described in the chapter on school records is simplest.

Any serious illness may delay menstruation for a year or two. After the periods have begun steadily, they may cease for a time. Cold or great excitement may cause the flow to stop suddenly. When this happens and there is discomfort, it is best to put the feet in hot water and mustard. Any big change of climate or circumstances may cause irregularity, which need give rise to no anxiety. I have known girls who lived in the plains in a tropical country, and whose periods ceased when they went up to the hills to school, and began again when they went home. One of the reasons why a sea voyage—an entire change—is sometimes recommended for a delicate girl is that it may give her a rest in this respect.

(2) Girls sometimes suffer through losing too much blood, either because the periods come too close together, or because the flow is excessive and lasts too long.

There should be about twenty-eight days between the beginning of one period and the next. Where they occur every fortnight or three weeks, the girl's general health needs attending to, and as drugs are often of considerable value, a doctor must be consulted. The trouble usually means that the girl's life is too exciting, or she is very run down or overworked.

Too much blood is lost when a girl uses more than eight to twelve towels during her period, and here again a doctor should be consulted. Hot weather increases the flow, and in perfectly normal girls excitement, such as school examinations, may do so in a very marked degree. Girls who suffer in this way need quiet and rest during the periods, and should keep their feet up when possible.

(3) *Dysmenorrhœa*, or painful menstruation, is unfortunately all too common in civilized countries. The pain may vary from simple discomfort and backache to intense agony, but whenever it occurs, the advice of a specialist should be sought *at the beginning.* Too often delay and carelessness mean that habitual ill-health is established, and the girl's whole life spoiled by suffering and limitations. The pain may be due to some organic defect, or to general delicacy, and only a doctor can decide on the cause. Very often a girl is all right for the first year or two, and only begins to suffer when she is pressed by examination work or home worries. In any case, all that is possible should be done to relieve the pain during the periods, and in the interval she should live a quiet regular life, with as little pressure

as may be in these strenuous times. Girls who suffer in this way are often too "keen" and apt to live at too great a rate. Any sort of outdoor occupation which will induce them to "potter" and use their hands rather than their brains is of value, but whenever there is organic weakness, they must not be allowed to do too much standing. Strenuous games may or may not do harm. When a girl is really keen to play, and feels no sort of discomfort or over-tiredness after, she probably gains, and in practice I have found that nothing so greatly helps delicate girls as a game which takes them out of doors and makes them forget themselves. They should not, however, play for a day or two before the next period is expected, or while the period continues. They should especially avoid cold or wet feet, and when there is any tendency to constipation, a dose of medicine may be taken a night or two beforehand. Constipation alone may give rise to severe pain at these times. When a girl begins with pain and backache every month she is best in bed with a hot-water bottle. In some cases a very hot bath will help her, and a hot drink such as ginger and water. The two great things to aim at are rest and warmth. It is cheaper in the long run to lose an hour or two entirely, than to drag through three or four days of pain and discomfort. I have known many girls to whom this beginning properly made the whole difference. Since such pain is sheer waste, and *the more you endure the more you are likely to have*, it is iniquitous to make girls who suffer in this way get up and go off to school, when an hour or two's common-sense "looking after" may put them right. When the pain does not pass off, but continues, or is really bad, a footbath with hot mustard and water may give relief, or fomentations sprinkled with turpentine. Phenacetine may give relief, and other drugs may be given *under the doctor's direction.* It is best to go on steadily trying one thing after another till you hit upon a medicine which *does* relieve, for it by no means follows that what helps one person will help another, and there is always a possibility that the right drug or preparation is yet to find. I know of one case in which a girl who had suffered for years and tried apparently everything was relieved by a prescription given to someone else for quite another form of nervous pain. It need hardly be said that "pain killers" should never be given without a doctor's sanction. When opium is used it may give rise to sickness and fainting, and the remedy be worse than the disease. Anyone who is ordered drugs must be kept quiet and resting till their effect has worn off.

Girls who suffer much must not starve at the time. The pain is often largely neuralgia, and want of good food will increase it. Warm drinks are comforting, but alcohol (gin, brandy, etc.) inadvisable as it increases hæmorrhage. Tea or strong, hot coffee is sometimes recommended.

All hæmorrhage is weakening, and even in people who are little affected at their monthly periods, the nervous system is less easily controlled than at other times. Girls both need kindness, and must learn to be kind and sensible to themselves. Faults of temper and temperament, irritability, depression, worrying, excitability, are all too apt to get the better of them. If you make up your mind always to put aside at such times the subject of annoyance or worry, you will be surprised to find how a day or two later it has dwindled down. It is waste to spend strength in fighting troubles when they are looking bigger than Nature—or your friends and relatives—really makes them.

In conclusion, menstruation is a normal function, closely connected with all that is best and happiest in a woman's life. It involves certain limitations, and few women are at their best, mentally or physically, during the few days involved. If things go wrong, see a doctor who knows something about it, so as to get at the cause. Rest all you can with your feet up. Keep warm, and remember that you are viewing things and people through a somewhat distorted window.

CHAPTER XI.

BAD HABITS.

EVERYONE who has to deal with girls knows that there are many cases in which physical self-control is gained and kept with difficulty. Over and over again the "difficult" children claim our time, and we have to work at the problem of how best to help them; moreover, though all girls are not difficult, the majority go through difficult phases.

For our present purpose we may define a bad habit as any action which should be under the control of the will, and has ceased to be so. The harm, in many cases, lies not in the action or thought itself, but in the inability to control it.

Bad habits may be those of childhood which have never been brought under control, or they may be acquired. Among the former we may consider picking in its many forms, chewing, and the wetting of the bed or clothes. Among the latter, making faces, abnormal appetite (as when a child devours such substances as paper and pencils), "bad habits" in the technical sense of the term, and improper thinking and talking.

In quite tiny children, up to the time of second dentition, undesirable habits may be checked and cured by quick observation, and promptly putting the undesirable trick under the category of "naughty" things; but keep in mind that there may be a physical cause, in which case it is *our* business—not the child's—to discover it. Moreover, it is useless to forbid any action without substituting some other interest. A child who is picking should be given something else to do with its fingers.

A morbid child should be trained to think of other children. But, if through defective training or inherent weakness, girls come to school age with such habits, how can we help them?

In the first instance, never appeal to a girl's will till you are sure that physical self-control is possible for her. A child's wetting its bed may be the result of acidity or complete lack of nervous control, abnormal appetite may be associated with anæmia, and in most cases the girl who has such difficulties needs helping on the physical side. Let the doctor see her, and make sure that she is well or in the best environment for becoming so. The following suggestions are given for the sake of those who find it difficult to get medical advice:—

Biting nails.—Burnt alum may be painted on the finger-tips as a reminder to the child.

Grimaces.—When due to cracked lips, the lips should be kept covered by lip-salve or cold cream or lanoline.

Where a nervous child is constantly "making faces," never refer to it. Treat the general health. Open air, plenty of occupation and sleep, and a very regular life will be effectual, whereas scolding will only make her self-conscious and aggravate the evil. Worms and St. Vitus's dance sometimes cause grimaces. These must be treated by a doctor.

Picking, and fidgeting with the fingers.—Give the child some hand work—knitting or drawing or modelling. Restless, nervous girls often find such work really restful. Let the child sleep in gloves.

Wetting bed or clothes.—This trouble is more common in cold weather, and in cold climates. Even if cured in the summer, it may return in the winter. This is because the skin and the kidneys both excrete waste products; but in the cold climates the skin is blanched (*i.e.* the blood vessels are contracted and less blood flows through them), and the work is all left to the kidneys. Thus in cold weather the kidneys have more work to do, and the trouble is more likely to occur. Cut off all fluid after tea excepting what is essential to quench thirst. See that the girl does not sleep lying on her back. (The old remedy of an empty cotton reel fastened round the waist behind will prevent this.) Let her be wakened last thing at night; in the daytime insist on regular habits, first sending her off every hour, then every two hours; afterwards encourage her to remember for herself. No excitement must be allowed her, as in almost all cases of such trouble a regular life and suitable food are the first essentials.

Abnormal appetite.—Where a child is constantly chewing pencils, pens, chalk, or eating quantities of dry food, give a good iron tonic (such as Parrish's Food, a teaspoonful three times a day); let her live out of doors as much as possible, and get long nights in bed. Chewing, in young children, may be due to second dentition, which sometimes causes them much trouble and in this case they may be given hard crusts; when the gums are much inflamed, a tooth brush constantly dipped in cold water and given to the child to bite on is a relief.

Bad habits.—When a girl is told about menstruation and its meaning, she should at the same time be told that any touching of the parts involved, except for necessary cleansing, is *wrong*, and may lead to ill-health. Should she have any such habit, a doctor should be consulted.

The habit may be due to some local irritation, but no amateur should attempt to treat it without medical advice. Hot baths should not be taken at night, but cold baths in the morning. Supper should be light and taken early. Avoid too soft bedding or over-heating.

One point with regard to school arrangements may well be mentioned here. A school dormitory should never consist of girls of the same age. Elder girls are the better for the responsibility towards the little ones. Every age has its own special faults, and where children of the same age are constantly herded together, these faults are apt to be accentuated and the outlook and interests of the class become very narrow; the fact that older and younger are much together is a real safeguard for both.

I have spoken first of material remedies because, as has been already pointed out, the average grown-up is too apt to ignore the physical weakness underlying many faults in character; but we must never forget that we are dealing with souls, not bodies only, and that efforts which evoke no response from the girl's will are doomed to failure. Make quite sure first that you are not demanding impossibilities, and that you are giving all the help which common sense and physiological knowledge suggest, and then get the girl's will on your side. If we once see, even dimly, that self-control is a beautiful thing, and the want of it pitiable, we shall probably decide for ourselves that we must be rulers of all our actions and thoughts. In all that relates to the body we should be reverent and therefore reticent. We no more talk about such things to all and sundry than we do about our other private concerns; but it is right that we should know them, and as we grow older and stronger we must take up the burdens which will always exist in a world where there is sin and weakness as well as good. If we can gain the spirit of reverence and knowledge, we have the best safeguard against certain forms of evil. No girl need ever feel that she has come in contact with things that those older than herself know nothing about. As a little boy said, "Oh, mother, I am so *glad* you know; now you will understand why I hate being with So-and-so!" Children sometimes suffer much from the burden of knowledge which they have come by in all innocence, and dare not speak about. If a girl has any such trouble, she had far better tell it out to the very best woman she knows—not another girl—and she may find she is making mountains out of molehills: the very telling it may help her.

Where girls have fallen into bad habits or undesirable talk at school, expulsion of the ringleader is essential. Complete change of association is a help, and time so filled with interest that there is no room for what is hurtful. After all, we can only think about one thing at a time!

Every one of us has to learn that impurity in thought, word, or deed is sin, and if ever girls come across it they must tell their mothers or someone in authority, and not discuss it among themselves. Then leave the subject alone; either in school or with an individual, it is the greatest mistake to dwell upon it. It is far better to fight it indirectly by making the general tone wholesome and happy, with *plenty* to do in work and play, and as many good books as there is time to read. Girls with unfortunate tendencies of this kind are apt to be untruthful and given to romance, and if they try really to tackle *this* fault, they will be helped to overcome the other.

In the one school which I have known where this particular difficulty existed, sentimentality was rife, and apart from lessons the girls had few interests. There was an entire absence of home life; when these causes were removed the effects also disappeared.

CHAPTER XII.

THE EYE.

Eyes are difficult things to understand, but it is well worth while to know something about them. The best way to make out the structure is to get hold of a good model and take it to pieces and put it together again. In any case, it is more clearly understood by pictures than description only.

The eye is really a hollow ball with a bulge in front, and a short thick stalk at the back, which contains the eye nerve and fastens it to the brain.

On the outside of this ball is a tough white skin, the sclera. Just where the bulge comes, this becomes transparent, so when we look at a person's eyes the "white" seems to stop. It is there all the time, but so clear that we look straight through it to the coloured curtain or iris. This thin transparent part of the sclera is called the cornea. The coloured curtain is the front part of an inner coat which lines the white. Just in the centre is a round hole or pupil.

Why have different people different coloured eyes? Everybody's eyes are really blue, for in all eyes the inside of the colour curtain is violet. In some people,

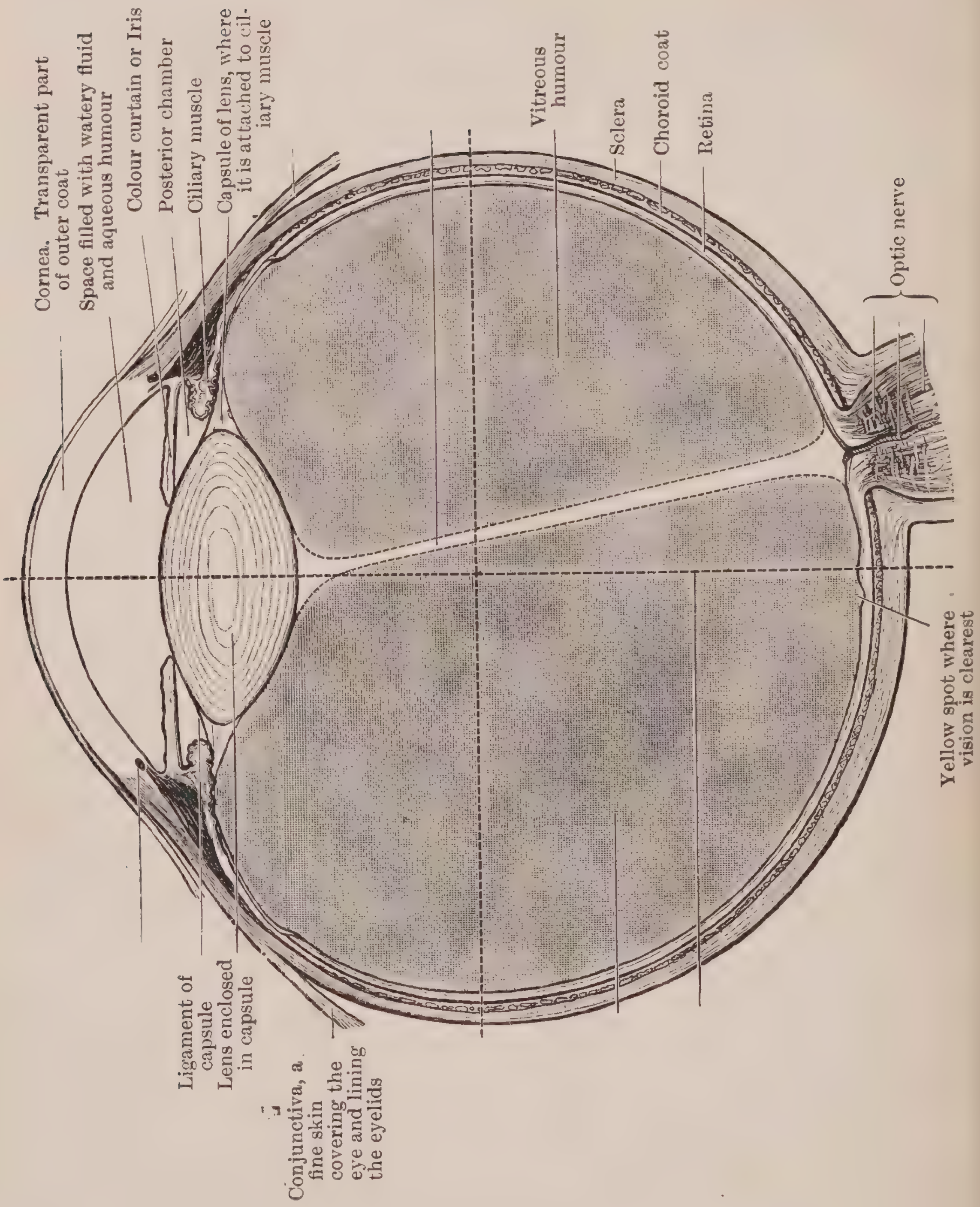
Cornea. Transparent part of outer coat
Space filled with watery fluid and aqueous humour
Colour curtain or Iris
Posterior chamber
Ciliary muscle
Capsule of lens, where it is attached to ciliary muscle
Vitreous humour
Sclera
Choroid coat
Retina
Optic nerve
Yellow spot where vision is clearest
Ligament of capsule
Lens enclosed in capsule
Conjunctiva, a fine skin covering the eye and lining the eyelids

Fig. 16.—Section of the eye.

however, especially amongst those who live in countries where the light is very strong, there is a brown layer lying outside the blue one. If the brown layer is very thin, our eyes will look green or hazel, or the brown may be in patches; if it is thick, our eyes will be brown or black. In babies the outside of the iris is very fine and clear, so the violet lining shines through and the eyes are a clear blue. As we get older the part outside the violet thickens, so even where there is no brown layer this violet may shine through less brightly and our eyes look grey.

There are two sets of muscles in the iris, some running round the hole in the centre, others radiating from it. When the first set contract, the hole is made smaller, and less light can enter the ball; when the others contract, the hole becomes bigger. Cats, rabbits, and all animals who sleep in the day and go out at night, have very big pupils, so that a great deal of the little light there is enters the eye. When we go into a dim room it seems quite dark till the radiating iris muscles have contracted to allow more light to pass through the curtain, and in the same way, if we pass from a dark house into the sunshine, the light will dazzle us till the curtain has drawn up round the hole. If we try to read or sew by firelight our eyes soon ache, for every time the flame flickers, the iris muscles have to try to adjust the size of the hole afresh.

The iris passes behind, into the coloured curtain or choroid coat, which runs right to the back of the eyes and up into the nerve stalk. It is quite dark coloured, and much finer and more delicate than the tough "white." The innermost layer of the eyeball or retina is very fine and built up of special nerves: these finally run into the stalk, and form the optic nerve going to the brain. Behind the pupil is a clear crystalline lens shaped rather like two watch-glasses placed edge to edge, so that it bulges out towards the pupil and into the hollow ball. This lens is enclosed in a fine transparent capsule with a rim running round the outside by which it is fastened to the ball;[1] just where the iris and choroid meet there are a number of small muscles, and when they contract they pull forward the part of the choroid to which the capsule rim is fastened; of course, the nearer to the front of the ball this rim is pulled the slacker will it be, and as the capsule is no longer tightly pulled on, the lens inside will bulge out. When the little side muscles relax, the rim is drawn back and pulls upon the capsule so as to flatten the lens. When we talk about focusing we simply mean making the lens bulge or flatten so that we can see things clearly. If they are close to us, the lens must bulge out; if they are far away, it must be pulled on and made flat.

The space between the iris and the bulging cornea in front is filled with "aqueous humour," the "watery" fluid; the inside of the ball with the "vitreous humour" or "glassy" fluid, which is rather like perfectly transparent white of egg. Covering the eye and running up to line the eyelid is a very fine transparent membrane or conjunctiva which is kept constantly moist by the tears, so that the eyelids can move over the eye without "rubbing" it.

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[1] If you think of a cachet such as chemists sell to prevent you tasting disagreeable powders, it will give you an idea of the capsule and ligament, but the eye lens capsule is more rounded.

There are two little glands between the eye and nose one on each side, and these are continually pouring out water which runs down a duct to the inner corner of the eye, and sometimes overflows as "tears," when too much is secreted owing to nervous stimulation.

The eye is really very much like an ordinary camera, but whereas the photographer cannot change his lens, but must move his camera to get things "into focus," *we* alter the lens itself.

From every object we see, rays of light pass into the eye. When they reach the lens, these rays will not pass straight through, and unless they strike it just at right angles they will be bent inwards.[1] The result is that at one point, "the focus," they will all meet and cross one another. Now if this focus is to give a clear image of the thing we are looking at, it must throw that image exactly on to one spot on the back of the retina, the yellow spot. When the rays are parallel, the focus itself will be at the yellow spot as well as the image. When the rays are not parallel, it must lie somewhere in front of the retina if the image is to be clear.

The image, of course, will be thrown on the retina upside down, just as in a magic lantern where you must put your picture in topsy-turvy if you want it the right side up on the sheet. The rays from the bottom of the picture have crossed and are now at the top.

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[1] The cornea and fluids of the eye also cause bending of the rays, but this is disregarded in the above account for the sake of simplicity.

It is in adjusting the focus, or place where the rays cross, that the work of the crystalline lens comes in. If we are looking at something a long way off, the lens must be flat enough for the rays of light to be bent so that they all cross at such a point as to throw the image exactly on to the retina. If the lens were on the same curve, when we looked at a book or something within about 20 feet, these rays would cross *behind* the yellow spot, and the image thrown on the retina would be blurred instead of clear and sharp. Anyone who has taken photographs knows that if a thing is too near the lens you cannot get a sharp picture on the glass. The eye meets this difficulty as the photographer cannot, by altering the shape of the lens so that it curves farther out; the course of the rays is changed and they bend more sharply, and will cross so as to throw the image exactly on the retina, as those at a distance did. Seeing things clearly, provided there is no disease of the eye, will depend entirely on whether we can so curve the lens as to bring the rays of light from things we are looking at to focus at the right spot. Some eyes cannot do this, either because the lens is too flat or too curved, or the space from the lens to the retina is too far or not far enough. When this happens, the focus cannot be in the right place, and we have long or short sight. The eye muscle which controls the lens is always straining to make the image clearer, and our eyes are quickly tired and we get headaches if we use them much.

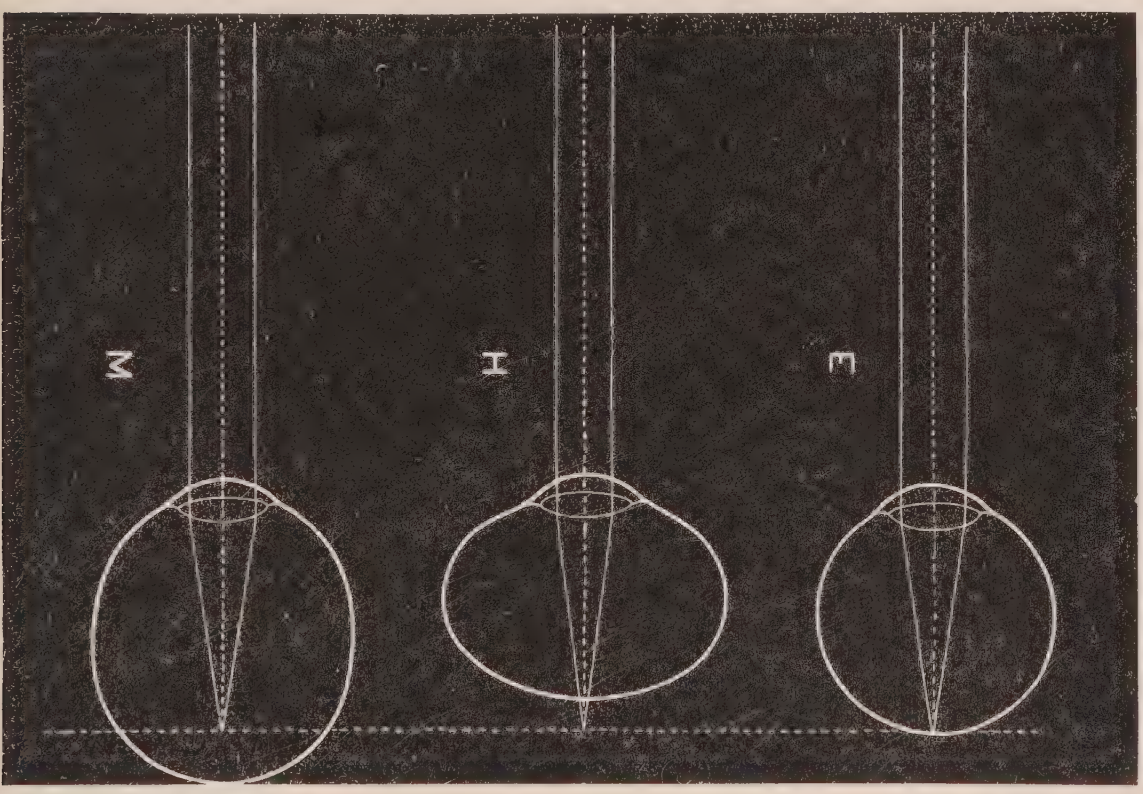

Fig. 17.—Diagram to illustrate correct, short, and long sight.

In E the focus falls exactly on the retina, hence the image is sharply defined.

In H the eye is too short from back to front, so the focus falls behind the retina and the image is blurred (long sight).

In M the eye is too long from back to front, the focus falls in front of the retina and the image is blurred (short sight).

In both cases the lens cannot accommodate itself sufficiently to correct the defect.

(In the case taken the rays entering the eye are parallel and therefore can only have come from an object at a very great distance.)

Long sight.—If the lens is too flat and the eyeball too short from back to front, the rays from objects close at hand will not be bent sharply enough to cross in front of or on the retina; they will meet at a point behind it. Girls with long sight find it very difficult or impossible to thread a needle, and trying to read or do needlework soon tires them. They often squint, for they are so busy trying to make one eye focus properly that the other is left to do as it likes! People with long sight are given convex glasses to wear when they are reading, or looking at things close at hand. The rays of light are bent inwards by the glass, which thus does part of the work usually done by the lens itself, and so takes away the strain which the muscles cannot cope with.

Short sight.—When the lens is too curved or the eyeball too long from back to front, the light rays from things at a distance will cross so that the image is thrown in front of the retina. People with short sight always want to pull things close to look at them, and they very often stoop over their work. They are given concave glasses to put the focus farther back.

Astigmatism.—If the cornea is not equally curved in all directions, the rays cannot all be focused together, and images will be indistinct. Here again the eye muscles will strain, and a girl get bad headaches when she tries to work. Spectacles for astigmatism have to be very carefully fitted and made, or the eyes will ache worse than before.

Squinting occurs when both eyes are not used together. As already explained, it may be a symptom of "long sight"; but an oculist should be consulted.

To sum up: The eye is a rather complex optical instrument, consisting of three coats—sclera, choroid, and retina—and an adjustable lens. The lens is hung in front, and the rays of light from objects outside pass through it, and form images on the retina. The retina is continued into the optic nerve, so that messages about these images are carried up into the brain. If the image is not clear, a message is sent down to the muscles which control the lens capsule bidding them contract or relax. Where for some reason it is impossible to focus correctly, these muscles will be constantly strained, and you will have aching eyes and headache.

Of course a delicate instrument like the eye must not be overstrained or ill-used, and we can do a good deal to keep our eyes if we will only use our common sense as well as our knowledge. In the first instance, make sure that you use both eyes, not only one. A good many people have a lazy eye which leaves all the work to the other. You can find this out by covering up each in turn, and if there is a very marked difference, it is as well to consult an oculist. Children's eyes should be tested with the sight card that can be obtained from any optician.[1] I once met a girl of sixteen so short-sighted that she could not see large blackboard writing about 5 feet off. She was rather surprised when I told her her eyes were not right! Of course, if you have always been the same, you don't know there is anything the matter till you test and compare with other people.

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[1] Midland Educational Co., Birmingham, print a sheet suitable for this purpose.

The amount of light and the direction in which it comes both matter to the eye.[1] Best of all is light from above, such as we get out of doors. In the house light should come from the left side when we are working, so that no shadow falls between our eyes and the work. I have already explained how a flickering light such as comes from the fire or a candle tires out the iris muscle. Very bright light may injure the retinal nerves, so arctic explorers and blue-eyed people in the tropics have to wear dark glasses, by which some of the rays may be absorbed before they reach the eye. It is always better to do something to alter a "glare" when you notice it. A dim light strains the eyes; there is too little contrast in the objects you are looking at, and you try to see more clearly than you can.

Printing even in newspapers is better than it used to be. Clear type matters much more than size. Very glossy paper which reflects the light is tiring.[2] It is better to read holding the book up about twelve inches in front of your eyes, than to put it flat on the table and bend over it.

A great many people have trouble with their eyes; the whole instrument is so delicately made and so very sensitive. *Never* try to use sore or aching eyes; rest and bathing with boracic lotion often relieves them.

Conjunctivitis.—This is inflammation of the conjunctiva or membrane which lines the eyelids and covers the front of the eye. The white of the eye appears "bloodshot." Often the eye waters and aches.

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[1] See section on Light in the chapter on "The School."

[2] *Ibid*

Conjunctivitis occurs with a cold in the head, hay fever, and at the beginning of some of the infectious fevers. It is common in hot countries where dust and flies are rife. In England the dust from motoring may irritate the eyes and so set up this trouble. In all these cases the cause of the inflammation should be treated. A veil will keep away the motor dust. Constant bathing may prevent flies and dirt working havoc in tropical countries.

Certain forms of conjunctivitis are highly infectious, and not only this, they may become so serious that they endanger the sight.

In these cases the inflammation increases, matter is formed, and on waking the eyelids seem glued together. The matter must be carefully sponged away with a piece of clean lint and warm boracic lotion. Bathing with this is a relief so long as the conjunctivitis continues. The lint should be burnt after use.

Corneal ulcers.—When conjunctivitis over the cornea occurs little ulcers may result which on healing leave scars or little dull spots. These appear as black specks in the visual image, and nothing can be done for them then.

Watering of the eye and dislike of light are symptoms which always demand medical attention.

A stye is inflammation in the hair follicle of the eyelid. A little abscess forms, bursts, and the stye heals.

Anyone with a stye should keep indoors, or if obliged to go out cover the eye up and avoid cold. Lint well rung out in hot boracic lotion should be constantly applied to the place. The pad of lint used should be thick enough to keep the heat in for some time when well covered up.

Styes occur in anæmic, tired-out girls, who as we say are "run down." This is a very good expression. Like clocks, they must be wound up again; and fresh air, sunlight, good food, and plenty of sleep are the things which wind up the human clockwork.

If styes continue in spite of everything, the doctor may resort to staphylococcic vaccine.

Black eyes are caused by injury. A blow in the neighbourhood of the eye tears the blood vessels and allows the blood to flow into the loose tissue surrounding the eye.

If ice or cold water is applied immediately the blow occurs, the cold tends to contract the blood vessels and diminishes the outflow of blood.

If the blood is drawn off at once (but this can only be done by a medical man) a "black eye" can be avoided altogether. Once the bruising and blackness shows, time is the only remedy, and nothing can be given but sympathy!

Dust in the eye.—A speck of dust or a fly may get into the eye and cause pain and watering. If the eye is shut gently, the offending particle will often be washed out by the tears. Sometimes the dust or fly has to be removed. To do this, something soft and clean must be used, in order not to damage the delicate structures concerned. The screwed-up corner of a clean handkerchief or piece of boracic lint answers the purpose very well. If the dust has gone under the upper lid, you should look down while the eyelid is carefully turned back over the wood of a match, and the speck can be easily removed. Similarly any particle can be removed from the lower lid.

CHAPTER XIII.

THE BLOOD STREAM AND INFECTIOUS DISEASES.

If the web of a frog's foot be taken and spread under the microscope, you can watch the blood coursing through it like a river; and if you have the skill to apply high magnification without damaging the frog in any way, you can see that this river is a rushing stream, carrying along with it numerous boulders, which bump and jostle one another in their course. I know of no other way in which one can so fully realize the perpetual movement and struggle in the blood of any living being.

If we look closely at a drop of our own blood we find it consists of a colourless fluid, "plasma," in which numerous very minute living bodies or corpuscles are rolled along. These corpuscles are of two kinds—the first and most numerous, small pale yellow and disc-shaped; the second white, and constantly changing in shape, as the living substance of which each is composed flows out or rolls itself into a little ball. Each corpuscle has its special work to do; the red are the oxygen carriers, and do not concern us here; the white or "leucocytes" are the disease fighters.

The blood is not contained in closed vessels like glass or rubber tubing. The capillaries or smaller blood vessels have walls built up of tiny bricks of living matter or cells, and as these are quite soft, fluids can ooze through them. Thus the tissues in which these vessels lie are continually receiving food from the blood stream and passing into it the waste matters which they must get rid of.

As the wall of the capillary is not a continuous sheet, but built of cells, it is possible for the leucocytes to make their way through into the blood stream and to pass out of it to the surrounding tissues. Here they may meet with minute living beings which have found their way into these tissues. Such plants are far too small to be seen except with the microscope, and they consist usually of a minute speck of living substance which, when it finds itself in comfortable circumstances, divides and redivides at an extraordinary pace to make new plants and animals like itself. Meantime it continues its own life, taking in food and giving out what it has no need of. The greater number of these tiny beings are plants which are classed together as bacteria. There are a number of different kinds, some harmful, some very useful, and each kind does its own work and produces substances peculiar to itself. Bacteria are found everywhere, in air, in soil, in water or milk, and are always at work. They are very difficult to destroy as they can live at extremes of temperature which would kill us, and when things are bad they can stop work, surround themselves with a thick coat, and mark time without feeding or working, till they find themselves in more favourable surroundings. When we talk of infection lingering in a house, we simply mean that if the bacteria are not *destroyed* by disinfecting, they may remain dormant for weeks or even years, and wake to life directly they find themselves again in a living body. Though some bacteria are useful, others do only harm, for they take from the blood what they want for their own life, and constantly pass into it the poisons or toxins which they manufacture.

It is here that the work of the disease fighter or leucocytes comes in. Bacteria may enter with the food or with the air we breathe, and whatever the place in which they proceed to multiply, the blood stream at once brings up armies of leucocytes to fight them. These little specs of living matter may flow round each invader and digest it. On the other hand, where there is a strong invading force, the leucocytes may find it impossible to destroy their enemies, and the latter may temporarily get the upper hand. The body must now set to work to form substances (antitoxins) which will act as antidotes to the poisons (toxins) manufactured by the bacteria. If there are more bacteria and more toxins than leucocytes and antitoxins can deal with, we "take" the illness badly. What this illness is will depend on the kind of bacteria that has gained the upper hand. It may be diphtheria, cholera, or any other infectious disease.

Now, if we are making a garden or planting a farm we have two things to think of all the time—the soil itself and the plants we are going to grow there. In the same way when we are fighting disease we can think of the blood stream and tissues as the soil, the bacteria as seeds of an extraordinarily harmful weed. We want to make the soil such that the weed cannot grow in it, and we may also work at destroying the weed itself.[1]

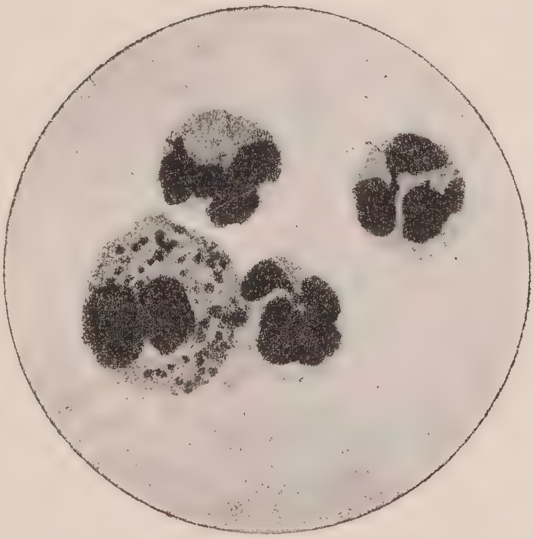

FIG. 18.—Microscopic slide showing a leucocyte ingesting bacteria.

In all children the "power of resistance" to disease is weaker than in grown-up people; their body is a more fertile seed plot for bacteria, so infectious diseases spread rapidly among them, and are difficult to stamp out. This power of resistance varies very much in different girls. One girl catches colds constantly, another influenza. In practice we must in all ways help the blood to do its work by giving plenty of good food and fresh air, so that it is kept in good condition. Chill, where a person gives off heat faster than he can obtain it, will hinder the leucocytes from working, and render them specially unfit to fight any undesirable invaders. Never go in to see anyone who is ill with an infectious disease when you are hungry, tired, or chilled; and when infection is going about, see that you are doing your best to keep yourself generally fit.

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[1] See *Science Progress*, January 1913, "The Mechanism of Infection in Tuberculosis."

We all hear a great deal at present about tuberculosis and sanatoria. We know that when people have consumption they are made to eat a great deal, sleep a great deal, and live out of doors. None of these things will kill the "tubercle bacillus" (the particular bacterium) which is causing the illness, but they *will* fit the body to destroy the poisons which these bacilli are manufacturing, and in the end to get the better of the bacilli themselves. Bacteria cannot live and thrive long in a thoroughly healthy body.

When disease germs have really got the better of the leucocytes, the person concerned becomes infested with them. They may be present in the breath and in *all* discharges of any kind whatever from the body. The air in contact with the person may become charged with them, and of course they are only waiting their opportunity to gain entrance to someone else. Hence, besides increasing our power of resistance, we also try to destroy the disease bearers around us—that is to say, we use disinfectants or antiseptics.

Burning is one of the best means of destroying bacteria. All rags, poultices, and half-eaten food should be put into a red-hot fire. They must never be allowed to smoulder, as in this way still living germs may be carried up the chimney. Carbolic acid, 1 in 20, is one of the best disinfectants, but should not be used for wounds as it sometimes causes gangrene. Condy's fluid (or potassium permanganate) is useful, as it changes from crimson to brown as its power becomes exhausted. Of course, as disinfectants are used to poison living germs, they are all equally poisonous to ourselves, so they have to be handled carefully and not left about.

The important principle to remember is, that nothing from an infectious patient, whether it be discharge, or excretion, or clothing (bed-linen, handkerchiefs, etc.), must *ever* be left lying, or carried about. All such things are sources of danger, and should be disinfected immediately. The disinfectant should be brought to the bedside and anything put straight into it. For disinfecting excretions from the body there must be as much disinfecting solution as excretion. Corrosive sublimate, 1 in 500, is cheap, but very poisonous. I would lay great stress on carefulness over disinfecting, as so few people seem really to understand it. Quite lately, when I was ill with sore throat, which turned out to be scarlet fever, I was told that my uneaten food was given to the cat. Poor cat! Of course, animals may both catch and carry infectious complaints. Tubercle from the cow and cow-pox are both well known. In throat affections, especially in diphtheria, cups and spoons should be frequently disinfected by boiling them for about twenty minutes.

In all infectious complaints we can distinguish four stages. First comes the period of incubation when the system has been invaded, but there is no outward sign of it. Next, as the bacteria multiply, and their toxins begin to affect the person attacked, we have the period of invasion. Then comes the illness itself, during which the person is fighting to counteract the disease, and lastly, convalescence, when she is regaining strength. It is during the period of invasion that we can just recognize that something is wrong. Everyone who has charge of girls should know enough of the symptoms to recognize them, as if a girl is isolated and her things disinfected *at once*, the disease will have far less chance of spreading.

Typhoid is very difficult to recognize in the incubation and invasion periods. It begins gradually; the patient feels tired and good for nothing. Sometimes there is headache and cough. Sometimes there is bleeding from the nose, sometimes diarrhœa, the excreta being pea-soup colour. The disease attacks the walls of the intestine, which may become thin to breaking point. Everything depends on keeping the patient perfectly still and giving only liquid food, or exactly what the doctor orders. The plant to which typhoid is due lives and multiplies in the excretions, so if these are sent down a drain or buried without disinfection, the disease may be spread far and wide, as the infection may pass through a considerable distance in the soil and so get into the drinking water. In the case of the Lausen outbreak the bacteria travelled with the water through about a mile of solid earth, and the disease broke out afresh in a place which had had no connection with the first persons attacked by it.

Scarlet fever or *scarlatina* usually begins with shivering, sore throat, headache, and sickness. In a few days a fine scarlet rash comes out, usually first on throat and chest. Later on, the whole epidermis comes away in flakes (peeling), and the patient is considered infectious till this process is over. The throat is often exceedingly painful, and is usually swabbed out every three or four hours. The finger or a pencil is covered with cotton wool, forming a swab, then dipped in carbolic, 1 in 30, chinosol, or some other disinfectant, till the wool is well saturated. The finger is then passed down the throat; on withdrawing, the cotton wool should be burnt at once. Chinosol is better than carbolic for regular use, as the latter may cause other troubles. Another danger in scarlet fever is kidney trouble, so patients must be carefully guarded from chill. When there is any discharge from nose or ear the patient is considered infectious till it ceases.

Measles usually begin with a bad cold, and running at the eyes and nose. A fine rash then comes out, beginning on the face and then spreading. The great thing to be guarded against is chill of any sort. Eye, ear, throat, and lungs are all affected and peculiarly sensitive, and careless nursing may lead to lifelong trouble or death. People are far too apt to think of it as a simple complaint in which care is little needed. It is often simple, but bad nursing, or other causes, may make it very serious.

German measles.—The rash comes out principally on face and forearms, and there is little fever.

Small-pox begins with general uneasiness, pain in the back, aching limbs, sickness, and fever; on the third day small red pimples come out under the skin, principally on the forehead, and each ends by forming a small abscess. The pain from these is very great, and there is high fever. There are many complications, including inflammation of ear and eye. Where a girl who has been vaccinated takes the disease, she gets it in a very much milder form. Vaccination is said to give immunity for seven years. But it is wise to be revaccinated whenever one enters a small-pox area, *e.g.* Egypt. Fortunately, in this country vaccination has been carried out on a sufficiently extensive scale to make small-pox a little-known disease. If a person be exposed to infection by small-pox and is vaccinated at once, the vaccine will work sooner than the small-pox, and the attack be prevented.

Chicken-pox is a troublesome complaint. The patient may feel more or less ill, and large spots come out, usually a few at a time. The spots are not unlike small clear blisters, and they form scabs.

Erysipelas, or St. Anthony's Fire, attacks head and face, causing inflammation of the skin. It gives rise to great pain and swelling. The parts affected should not be washed, but dusted with powder, and great care should be taken of the eyes; they should be bathed with boracic lotion.

Erysipelas may also occur in any wounded surface.

Mumps begins with feverishness and stiffness in opening the mouth; the parotid glands, *i.e.* those lying in front of and under the ear or on each side of the jaw, swell up and become hard and painful. The swelling may last for four or five days, and then begins to go down. The pain can be relieved by very hot applications. Other glands in the body may be attacked at the same time, but this is rare.

Ophthalmia and *conjunctivitis* affect the eyes. "Sore eyes" are often extremely infectious. There is a dense sticky yellow discharge, so that after sleep the patient may be unable to open the eyes at all. The eyes should be frequently bathed with warm boracic lotion, the rag or cotton wool used being destroyed after each application. When there is any eye discharge, medical advice should always be sought at once. This disease is often spread because children use the same towels.

Diphtheria may begin with sore throat, or there may be an offensive discharge from the nose. A membranous growth in the windpipe may cause choking, and in this case an opening is made in the trachea, through which a tube is passed so that air may reach the lungs. Whenever possible, diphtheria is now treated by injecting antitoxin directly into the blood of the patient, and the discovery of this treatment has made it a much less dangerous illness than formerly. There is always danger of sudden heart failure with diphtheria, so the patient has to be kept very still and not allowed even to sit up, or to have any excitement. The medical officer of a large fever hospital says that heart trouble is common about the tenth day, and blue lips and pallor should be carefully watched for then. A diphtheria patient must never be allowed to get in the least constipated; the slightest straining may give rise to heart failure. Most careful watching is needed during recovery, as paralysis often follows about a month after a child is considered cured.

Influenza is a many-headed monster. Feverishness, headache, and aching limbs are constant symptoms. Where it is neglected it may leave most serious after-effects ; bed and immediate care will save time, not waste it. Pneumonia may follow on neglected influenza or the attempt to get about too soon.

Colds and sore throats are *infectious,* and should be treated as such. A day away from school is far better than sitting with a martyred expression bestowing your cold on a delicate girl to whom it may mean a week's illness. Colds should be nipped in the bud. Plenty of eucalyptus, warm fresh air, and ammoniated quinine are all useful. It is foolish to take no notice till the thing has a thorough hold on you. Of course, some people take colds and shake them off very easily, but that is no excuse for infecting their less robust fellows.

Whooping-cough may be suspected when the cough comes on suddenly in paroxysms of choking. The *whoop* may or may not be present. Once heard it is never forgotten, but it cannot be described. At the end of a coughing bout the patient is often sick. People with whooping-cough should be out of doors as much as possible. It is extremely infectious, and one of the most tedious complaints. Great care should be taken to avoid cold, as bronchitis and pneumonia are complications.

Isolation.—Girls who have been exposed to infection must be kept in quarantine till it is quite certain they are not incubating the disease.

The following table gives the periods during which a patient is infectious and the time which should be allowed to elapse before any girl who has been exposed to infection is safe again :—

	Period during which Patient is Infectious.	Quarantine after Contact with Infection.
Typhoid . .	4 weeks.	3 weeks.
Scarlet fever . .	6–8 weeks, till peeling and all discharges cease.	7 days.
Measles . . .	3 weeks.	7–18 days.
Small-pox . .	Till all scales have fallen off and all sored healed.	18-21 days.
Chicken-pox . .	Till all scales have fallen off.	21 days.
Mumps . . .	14–21 days.	26 days.
Erysipelas . .	..	7 days.
Ophthalmia and Conjunctivitis	So long as there is any sign of discharge or soreness.	..
Diphtheria . .	3–4 weeks, or until the germ is absent.	10 days.
Influenza . .	..	2–3 days.
Whooping-cough .	Until the whoop has disappeared.	15 days.

Tuberculosis may assume very many forms according to the part of the body attacked by the tubercle bacillus. Sometimes it is in the glands, sometimes the lungs, sometimes other internal organs or joints, as the hips. The patient loses weight, and gets feverish and sweats at night. In every case the illness is fought mainly by trying to build up the body to resist it. Hence the treatment consists of plenty of food, rest, and fresh air and sunshine.

Whenever a person is in bed for a long time the skin is liable to get sore where it is constantly pressed on, *e.g.* the back, heels, and elbows. This soreness can be avoided if equal parts of methylated spirit and glycerine are put in boracic ointment and rubbed on after washing.

In all fevers complications may occur, so even the mildest case needs careful watching. Three things require special emphasis :—

(1) Chill of any kind is *dangerous.* If up and about, a girl must be warmly clad. The more fresh air she gets the better, but she must not feel cold. If in bed, children need careful watching to see that they do not get up and run about or sit up in bed without sufficiently warm clothing. There is no reason why patients should not be washed all over, but it must be done bit by bit, only uncovering a part of the body at a time. In all chest and throat troubles the air should be kept damp and warm during illness; as this increases susceptibility to cold, a child who has been kept in a warm room at an even temperature should not be allowed out for several days.

(2) Great care should be taken about food. Above all, nothing must be given against doctor's orders.

(3) The patient must be kept quiet. There is no need for her to be lonely or dull, but a great deal of talking or anything to cause excitement may raise the temperature.

Disinfection of the clothing.—Linen may be disinfected by boiling. Clothing, if it is washable, should be put straight into izal. Woollens must be exposed to a dry heat of 180° or 200° F., and this is done best in the ovens of the sanitary authorities.

Disinfection of the patient.—After any infectious fever it is advisable to let the patient have several weak potassium permanganate baths, only sufficient crystals being used to keep the water pink. The hair must also be well washed in disinfectant.

Disinfection of the room.—All woollen and linen things must be removed from the room and disinfected. A sulphur candle is now placed in an earthen vessel which should rest on two or three bricks in a large pan of water. All the ways by which air might enter the room are blocked—the fireplace, the window, any ventilators, cracks, or crevices. The sulphur candle is lit, and then the door carefully fastened up on the outside. No one, of course, could stay in the room. After five or six hours, the sulphur will have burnt itself out, and the atmosphere, which is full of sulphur dioxide, will have killed all life, including bacteria.

Subsequently the floor, walls, and ceiling should be washed with some weak disinfectant, such as sanitas or formalin.

CHAPTER XIV.

THE MEDICINE CHEST.

MEDICINES should be fresh, for all chemicals are apt to go stale. Hence it is bad economy to lay in too big a stock at once. The following are all useful in emergency or commonplace ailments:—

DISINFECTANTS.

Eucalyptus.—For spraying and steaming. To steam, use 1 teaspoonful to a pint of water: if too strong, it may cause choking and spasm. Useful in influenza-cold, sore throat, threatening of infectious illness.

Benzoin.—For steaming (1 teaspoonful in a pint of water). In chest and nose troubles.

Permanganate of Potash Crystals.—For mouth wash and general disinfecting purposes. It stains linen badly. Use enough crystals to colour water pale pink; when it turns brown it is no longer any use.

Boracic Acid Crystals.—Useful for bathing eyes, or boils and sore places, and for fomenting cuts. Use as many crystals as will dissolve; the water cannot dissolve enough to cause any harm.

Boracic Ointment.—For sores, etc., spread on lint, and then scrape off excess, leaving thin coating.

Carbolic Oil (5 per cent. carbolic).—For swabbing out throat.

LAXATIVES, ETC.

Castor Oil.—The dose will vary very much, some people needing more than others. 1 teaspoonful for children up to 12, after that a dessertspoonful. Its effect is first to purge and then constipate, so it should only be taken in case of diarrhœa or sickness, never for ordinary constipation.

Liquorice Powder or *Cascara* can be substituted for castor oil if desired. Also, a dose enough to cause action can be given every night in cases of constant constipation.

Oil of Paraffin.—1 teaspoonful three times a day for constant constipation.

Diarrhœa Mixture.—A prescription should be supplied by doctor.

Tannin and Glycerine.—For painting relaxed throat.

Listerine.—Gargling and spraying.

Ammoniated Quinine.—When a cold is beginning.

Mustard Plasters.

Thermogene Wool.—Wrapping round throat or chest where warmth is required.

Olive Oil.—For earache, or softening wax, must be dropped in the ear warm but not *hot.*

Oil of Cloves.—To rub on gum or put in tooth in case of toothache. Care must be used in applying any irritant of this kind, as repeated application will take the skin off.

Phenacetin, Aspirin.—For headache (5 grs.). For any neuralgic pain. Neither these nor any other "pain killer" should be used frequently except by doctor's orders; they only dull the pain, and the cause must be sought and dealt with by a doctor.

Turpentine.—To be sprinkled on fomentations in case of severe pain.

Methylated Spirit.—For bruises of the skin. Put it on and let it evaporate.

Lead Lotion.—If applied at once where any joint is "sprained," this may prevent further complications.

Salvolatile.—½ to 1 teaspoonful in a wine-glass of water for faintness.

Brandy.—1 teaspoonful in water for collapse after sickness or diarrhœa. This must never be given where there is hæmorrhage.

Salt.—For gargling weak throat (1 teaspoonful to a teacup of water). Strong salt and water is an emetic (*i.e.* causes sickness).

Mustard.—An emetic.

Cyanide Gauze.—For burns and dressings.

Bandages.—2, 3, and 4 inch.

Pink Boracic Lint.—For cuts and sore places. When used with hot water, it forms a poultice in place of the old-fashioned bread; it should be covered with jaconet or oil-skin to keep it moist, and then wool to keep in the heat.

Jaconet.—For keeping dressings moist.

Cotton Wool.

Safety Pins.

Rubber Hot-water Bottle.

CHAPTER XV.

HEALTH RECORDS.

"OH, these questions!" "When did the mental defect first show itself?" "I don't know; his mother said he was queer when he was quite little." "Put down five."

Such was the gist of a conversation I once overheard between two harassed teachers, pestered by a paternal Council to give information which they had neither time nor data to supply. Anyone who has seen much of popular education has probably also seen how the welfare of the children is apt to be overlooked in the all-important business of filling up schedules, with answers in many cases as valueless, if not actually misleading, as in the case just cited.

On the other hand, as memory and observation are fallible in the best of us, it is helpful to keep a written record of the girl's health during the years of growth. An overtired mother or teacher is apt to conclude that girls are tired too—in such case a graph which shows a child's weight steadily rising is reassuring; when a girl seems unaccountably lazy, a glance at the downward tendency of the graph may point to more play instead of extra lessons!

The nature of the records kept must depend in part on whether the school is for day-girls or boarders, and on the medical inspection given.

A simple form should be filled in by the family doctor for every child entering school, and this form must be kept by the school for reference. In cases where no family doctor is available, it is wiser to give the parents a simple form on which to state the most important facts in the family history, and any infectious diseases from which the child has suffered, and to leave detailed inspection to the school doctor. The medical inspection record will of necessity be in the hands of the doctor. In many boarding-schools he is retained at a fixed fee to visit every day—this plan when feasible is to be recommended, in that it may effectively check epidemics, as he alone is likely to know what illnesses are "going about," and whether a cold is to be taken as suppressed scarlet fever or incipient measles! No such "visiting" should interfere with or take the place of annual inspection, when every child is properly examined, and any recommendations made sent to the parents.

In all girls' schools records should be kept of absences and their cause, height, weight, and menstruation periods. A simple plan is to assign each girl a "personal graph book" when she enters school. These graph books should be accessible to the staff, but not to the girls. Where their keeping would involve much labour they could be given to the girls once a month *in class* for each to enter her own height and weight and make up the graph. The absence notice should include date, duration, and cause of absence. Weights are best taken monthly and recorded in graph form, and heights every term. (Of course girls should always be weighed in the same clothes and without shoes.) It is then easily seen whether a girl is deviating to any considerable extent from the average for girls of her age. Where a sudden fall is due to recognized illness, the fact should be recorded across that part of the graph. In working through the graphs of Swindon Secondary School girls I find that, except in abnormal cases, easily accounted for, the weight graphs for the girls of the same age at any given time show remarkable uniformity: it is significant that in the higher classes the rises take place in holiday months, then fall during the term, and that when only a short Easter holiday is given, the fall begun in the spring term continues steadily till the summer break. In view of the increasing danger of cast-iron regulations for children in secondary schools, and the forcing average girls through examinations at the minimum age, further work on these lines might be of value, in convincing authorities that holidays or shortened school hours and time spent out of doors are not necessarily waste of time.

A part of the "personal graph book" should be kept for recording the dates at which a girl's menstruation period begins, as by this means irregularity can be quickly detected. In boarding-schools girls will go to the matron, in day-schools the record is best kept by mistresses told off to look after the health and morals of a manageable number of girls. The reporting may be difficult in a big busy school, but where it is impossible for a girl always to find a mistress, it is best to have a sick-leave book: the girl simply writes her name on a sheet of paper, folds it, and puts it between the cover and first page. If for some other reason she does not want to drill or play games, she adds the reason; the mistress in charge hands a list to the drill and games mistresses, so that there is no likelihood of a girl's being called on for matches or to do additional work when she is least fitted for it.

I can imagine teachers and parents asking, "Why this fuss and elaborate system?" A matron once said to me, with reference to the improved health in a school I had charge of, "It has not been less trouble, but it seems to me we have worked to keep the children well, instead of nursing them when they got ill!" The keeping of such simple records prevents fuss, for girls who are used to care when well are quite ready to trust you when ill; further, it ensures the observation of facts which might otherwise be overlooked till too late. I knew one girl in a happy home with plenty of this world's goods. No one thought of anything wrong, till a friend sharing her room noticed that she pulled her pillows together in bed and lay propped up; lying down made her cough, she said. They took her to many doctors then, only to hear the old verdict—"Too late—if you had only come sooner." She had tuberculosis. No health record can take the place of sympathy, but it may in many cases prove a very valuable supplement, and a safer guide than our own biassed observations.

Report to be filled in by Parent when a girl enters School.

Confidential.—Is your daughter in good health?

Has she had any of the following infectious diseases, and if so, when? Small-pox, scarlet fever, measles, whooping-cough, mumps, typhoid, chicken-pox, ophthalmia?

If she has had any of the above, did they to your knowledge leave any after effects, such as heart trouble, discharge from eyes or ears?

Has she had any other serious illness or accident? If so, how long since?

Are her teeth in good order?

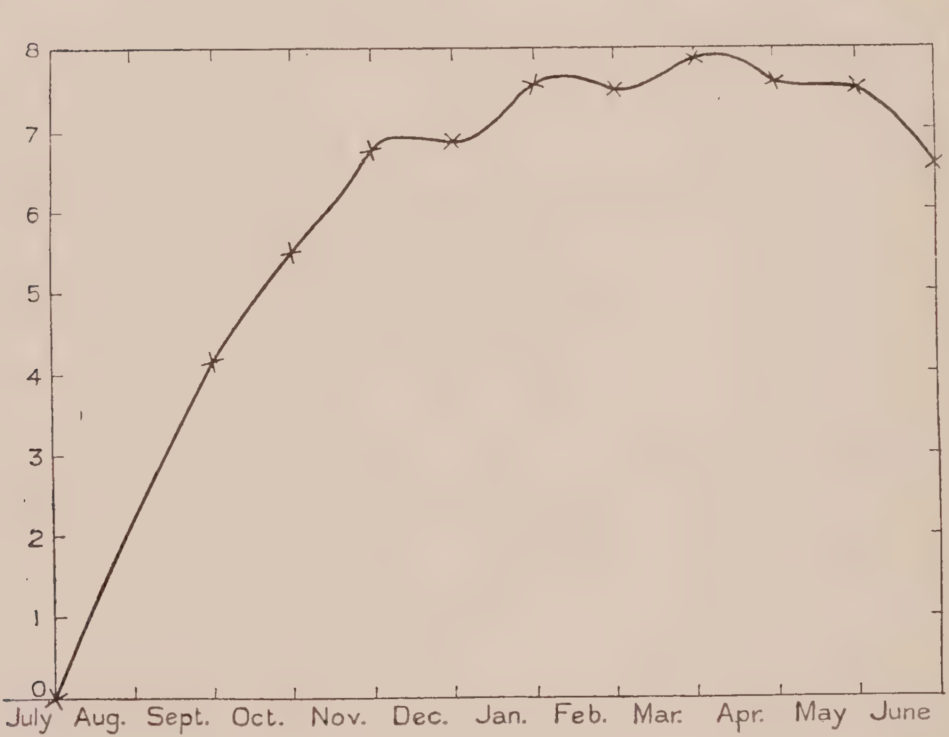
When was she last vaccinated?

Is there to your knowledge any tendency to rheumatism, nervous disease, or tuberculosis of any kind in the family?

General remarks.

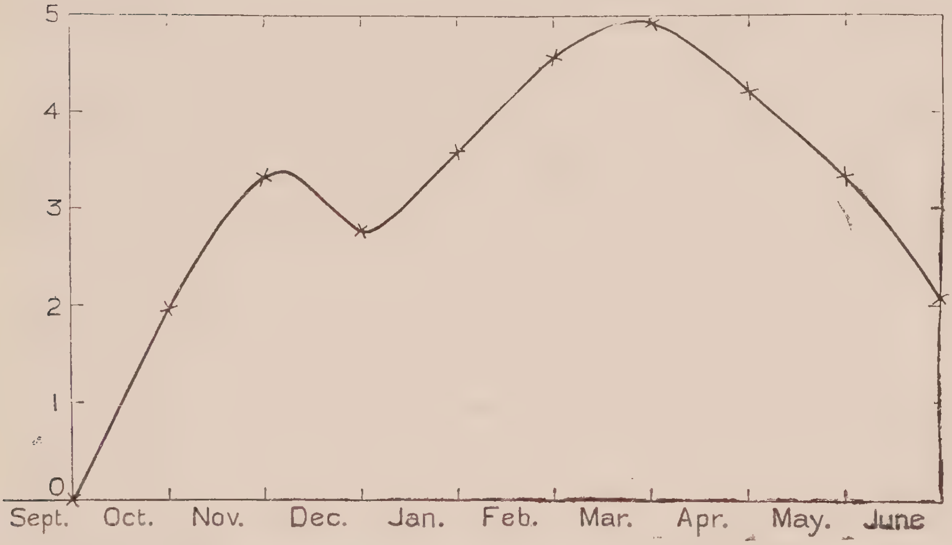
LIBRARY OF THE

I. Graph to show average increase and decrease in weight of girls from 15 to 16, in Swindon Secondary School, working for no examination. The rise in weight during the summer holidays is very noticeable.



Figures at the side indicate the number of pounds by which weight increases or decreases in the months shown below.

II. Graph to show average increase and decrease in weight during a school year, in the case of girls aged 16 to 17, working in Swindon Secondary School for a June examination.[1]



Figures at the side indicate the number of pounds by which weight increases or decreases in the months shown below.

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[1] The Health Mistress at Cheltenham Ladies' College tells me that this fall in weight does not occur in their girls. It is significant that the weight rises again during the summer holidays much as is shown in Graph I. These graphs are only tentative, and more work requires to be done on similar lines.

CHAPTER XVI.

THE OPEN-AIR SCHOOL.

THE first open-air school was started at Charlottenburg in Germany. There it was found that delicate and ailing children deteriorated if sent to an indoor school, but held their own and indeed improved if living out of doors. It was therefore decided to give them lessons out of doors, but as the children were not strong it was arranged that their hours for study should be only half those of the indoor children—*and* with this marvellous result, that in the end-of-term examination the outdoor delicate children surpassed the indoor strong, healthy children. Since that time there has been a gradual spread of outdoor schools—and the movement has passed from Germany to The Hague, and to England and America. In some of the open-air schools, readers should see for themselves the extraordinary benefit which children obtain through living and learning in the open.

At first open-air schools were for delicate children, and then people began to ask why healthy children should not have this benefit too.

The authorities of "The Phebe Anna Thorne School for Girls" (U.S.A.) say: "If abnormal or sick children

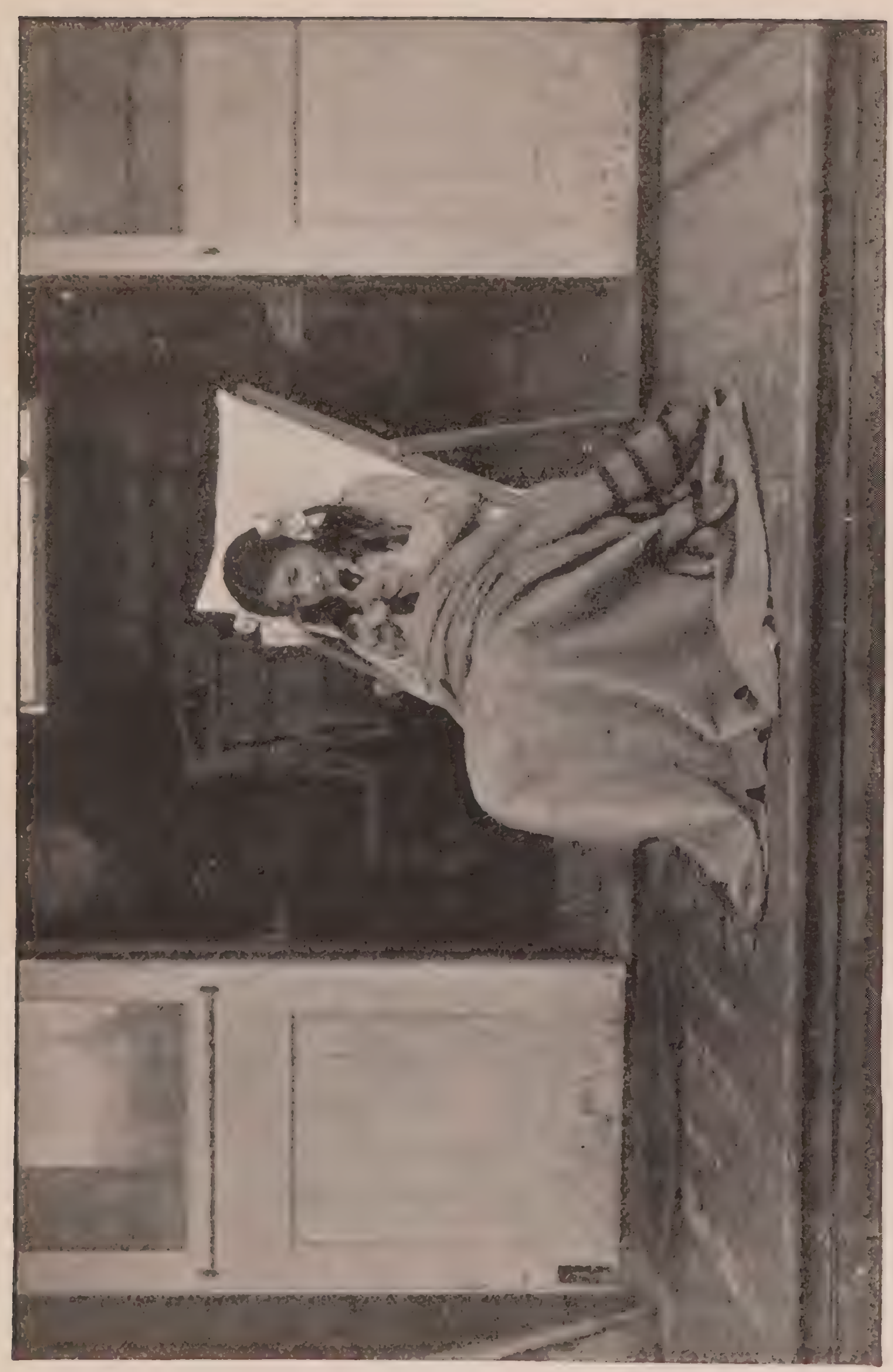

FIG. 19.—A convalescent at Broadlands, Medstead. The child is sitting out in the open, well wrapped up. Her hands are occupied in making a basket.

make such astonishing progress in their studies when they are taught in make-shift open-air tents or improvised class-rooms, it is claimed that normal children, specially selected and taught by the best methods in an out-of-door school constructed for the purpose, may be expected to attain wholly surprising results."

At this school, which is now being started, "only the dressing-rooms and laboratories will be indoors, and to provide for this there will be seven separate one-storey, out-of-door class-rooms, facing south, constructed of wood and glass in such a way that any one of the four open sides can be closed by glass screens in stormy weather.

"Each class-room opens on a large uncovered platform, which will be used for gymnastics and the open-air siestas which are a part of the open-air school curriculum.

"In cold weather all the children and their teachers will wear the so-called Esquimaux out-of-door suits with caps and gloves.

"It is believed that a seven years' course of study carried on consistently out of doors will enable normal children to accomplish much more in work and play than is possible in ordinary indoor schools."

In Chicago roofs of houses are being used for open-air schools, with great success.

"The presence of thirty children up on a roof, in all sorts of weather, in a Chicago climate, made a distinct impression on the educational forces of the city. In the early days of the school there was much apprehension about the comfort of the children. It was beyond the conception of many people that children could go to school in a Chicago winter in a room where there was no heat. This school has now run for the fifth winter. Last year the mean temperature in the month of January was 11·11° F. It certainly afforded a test. It was necessary for the children to go inside only three or four days during the whole winter. The problem of comfort has been met through the feeding and proper clothing of the children. There are days when it is somewhat difficult to keep them comfortable, but it is no longer a serious problem, and on the other hand the children are always keen and alert. There are never any dull moments. Their minds are as bright at 3 o'clock in the afternoon as they are at 9 o'clock in the morning."

Open-window rooms, in which large windows are always wide open, are advocated where a roof or a garden cannot be obtained.

In Regent's Park in London a band-stand is used as an open-air shelter for the delicate children of the elementary school, and here they have their lessons. They bring rugs with them in the cold weather, and of course they wear their outdoor clothes all the time.

In any open-air school the points to be thought of are:—

Warmth.—The children must be *warmly clad. Movement* in between lessons helps. Rugs, foot-muffs, snow-shoes, gaiters are all useful.

Damp.—The children must not be allowed to sit in wet clothes or wet shoes and stockings.

Goloshes should be insisted on if the ground is damp.

A raised wooden platform is provided at most open-air schools, both for the drilling and sedentary work.

Wind.—There should be protection from cold biting winds. A revolving shelter can always be turned to avoid the breeze. A shelter with glass screens can be arranged accordingly also.

Food.—Children living out of doors need more food, just as a fire burning out of doors needs more fuel than otherwise. And if it is possible to give them good food, the result will soon be noticeable.

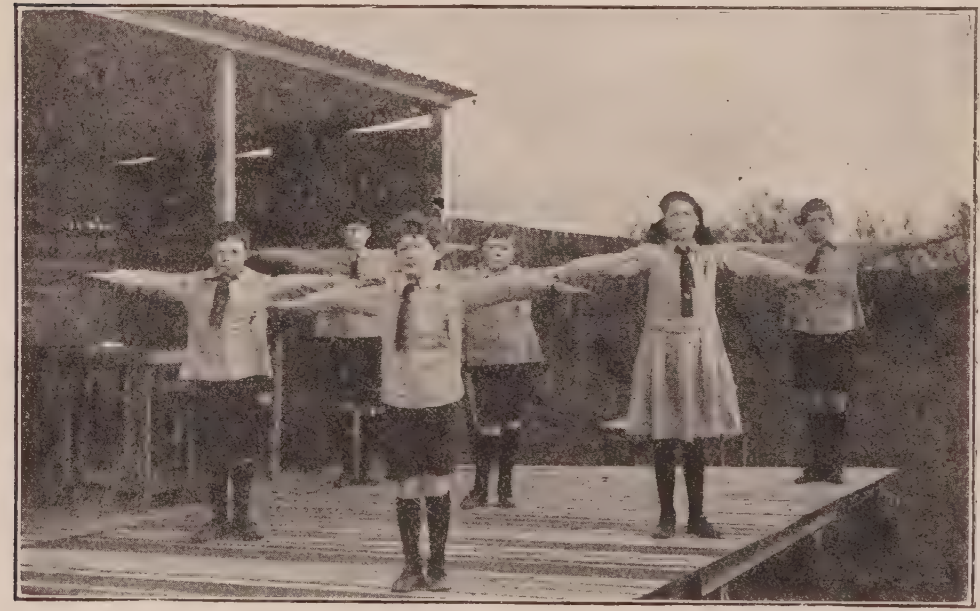

Fig. 20.—Breathing exercises at the Open-air School, Broadlands, Medstead, Hants.

The home.—If the open-air school is a day-school, it is advisable to try and get open windows and cool rooms in the home.

Extreme variations of temperature are not good for anyone, and stuffy rooms are very bad.

No one would think of putting a fragile plant into the garden by day and into the hot-house by night, all the year round.

Colds.—No child who sneezes or coughs should be allowed to come to school. If she is allowed to come, she should be kept in the open, she should not be allowed to enter the shelter.

Colds and coughs are infectious, but very much less infectious in the open air than in a room.

These are difficulties that can be overcome, but there is a further difficulty which gives more trouble. Whether it is an open-air school, an open-air nursery, or an open-air hospital, it is one and the same: the trouble is to find a conscientious nurse or teacher, who will wear sufficient clothes to keep herself warm, and who will conscientiously keep the children in the open.

There is the same trouble with open windows in elementary schools. The teacher feels a draught, and she orders the window to be shut. Now a draught is of itself an excellent thing: it is a current of air. But if the teacher is insufficiently clothed, the draught may chill her, and she being chilled, some decayed tooth may now work havoc and an attack of neuralgia set in.

She will say the neuralgia was due to the draught. A medical man would say the neuralgia was due to the decayed tooth and insufficient clothing.

And it is impossible to alter the views of people after a certain age. Their minds are as clay which once baked in Time's oven cannot be altered. However, with children it is different. They are eager and ready to take in new ideas. I was very struck by this a few years ago. A girl at a boarding-school in Washington listened with great interest to some lectures on hygiene. When she returned home for the holidays, she insisted on her father adding to their house a sleeping verandah, or "porch" as they call it.

"What for?" asked "Poppa."

"Why, to prevent tubercle!" the girl replied.

The porch was built. The girl's health improved tremendously. This year, it happens, she is to be married, and her father is building her a house with these sleeping verandahs! Thus have the seeds of the hygiene lectures grown.

But to return to the open-air schools: no yawns are known at them; no epidemics are known at them; the children are always keen and fresh and alert.

I am constantly asked if it is safe to allow a child who has not been brought up in the open air to go to an open-air school.

My reply is: "It is never too late to mend. At the Victoria Hospital for Children in Tite Street, Chelsea, London, we have sick children on the open-air balconies without any preparation, children who come from the stuffiest homes. They are out on the balconies, day and night, hail, rain, or snow, and when they go home they are so well and vigorous their parents assert they must have been to convalescent homes."

One lady said, "Yes, I know tuberculous children can stand fresh air! But they are so strong. They can stand so much!"

It was in vain to tell her that tuberculous children only get tubercle when all their strength to resist it has gone, and therefore they must be given fresh air to invigorate them and help them renew the fight.

Recently I went over the Open-Air School and Hospital at Heswall, near Liverpool, where Mr. Robert Jones, the orthopædic surgeon, does such splendid work. Many of the children come in cripples, and it struck me what a pity it was that all children could not have this open-air treatment, to prevent them becoming cripples, rather than to patch them up after they were cripples.

An interesting experiment in school hygiene at Winchester, Massachusetts, is described in the *Boston Medical and Surgical Journal.* Two seventh-grade classes, consisting of children of the same kind, were compared after one class had been for four months taught in a room so altered that a full supply of fresh air could be admitted. The temperature was kept at about 45° F., and the children were clothed in blanket coats and bloomers, with lined canvas boots. At the end of the period the children were compared with those of another seventh-grade class in the same building who worked in an ordinary room. It was found that whereas the average gain in weight of the open-air class was 3·61, that of the other class was 1·69. In height the open-air class gained 0·49, the other 0·24. In the hæmoglobin test the open-air class gained 4·55, while the other lost 3·07 per cent.

CHAPTER XVII.

THE SCHOOL.

ONLY a very small section of the nation can exercise any choice with regard to the school to which their children should be sent; the majority must take what they can get, and be thankful (or the reverse!), and what they can get generally means the large public day-school. On the other hand, the more fortunate minority can choose their school according to their girl, and it is impossible to lay down any hard and fast rule to guide this choice.

Whether a big boarding-school or a small private one, *everything* depends on the head; buildings, fees, examination results, stand for little or nothing compared with the character of the man at the helm. Where a head has been for some time, you can judge of the school largely by the type of the girl it turns out. I once took a medical friend to see over two schools for mentally defective children; directly we entered the second one, she exclaimed, "But these children are of a higher grade." They were not, but the staff was! If a day-school can exercise such influence, still greater importance must attach to the choice of a boarding-school.

SITUATION.

In choosing a boarding-school, *climate* must count for a great deal—a girl who is always well in keen, bracing air may flag in a Southern atmosphere, and *vice versa.* The school should be built where there is plenty of *space*, and wherever possible the playing grounds should be close at hand. Girls find a long walk to play games very trying, and it is often wiser to choose grounds which are, *per se*, less desirable but easily reached, than fine grounds at such a distance that the girls can use them only exceptionally, not daily. Boarding-schools should be in the country, where the necessity for town walks, crocodiles, and gloves does not exist, except perhaps on Sundays!

The site should be carefully chosen. Do not build a school, in this country, with a hill or trees on the south; we want all the available sunshine. Consider the prevailing winds, especially those which bring rain, and may make one side of the house constantly damp.

Soil is an important factor; sand and gravel are dry, clay is damp. Chalk or lime soil may mean hard water, and hard water means that no soap will "work" till sufficient has been used to soften the water—a serious drawback, involving as it does increased expense in any big institution. On the other hand, chalk and limestone are very porous and so form dry sites. A damp house is unwholesome, because all microbes prefer moist places and the constant evaporation makes it chilly.

In the tropics, an *adequate supply of pure water* is an all-important consideration.

Last, but not least, *consider the outlook.* Open country and big stretches of land or sea are valuable assets, to be considered of real importance, both for eyesight and character formation. In choosing our houses we have many limitations imposed on us from without, but these need not apply in settling on a school.

SCHOOL BUILDINGS.

The dwelling-house.—In the case of large boarding-schools the most satisfactory system is that of a central building to which the girls come for lessons, and separate boarding-houses, if possible in the playground. This plan ensures a certain break in monotony; moreover, if a girl is in trouble over lessons in school, she gets away to her home and a fresh atmosphere, and can start again next day. St. Leonard's School, St. Andrews, was among the first to adopt this method for girls, and with conspicuous success. The houses should consist of not more than twenty to thirty girls, and the life be as free and homelike as is compatible with good order.

The worst possible plan is where the girls all live in the school, and use their class-rooms as sitting-rooms. Too often in such cases, girls of the same age and mental standing are always together. This, as I have pointed out in a previous chapter, is an altogether unnatural arrangement, and the want of change when lessons are over, coupled with the difficulty of making a class-room with suitable school-desks as furniture into a room for recreation, adds a further objectionable feature.

When school and house are in one, the contrast with home is much greater than under the boarding-house system, and every effort should be made to prevent its degenerating into a barracks.

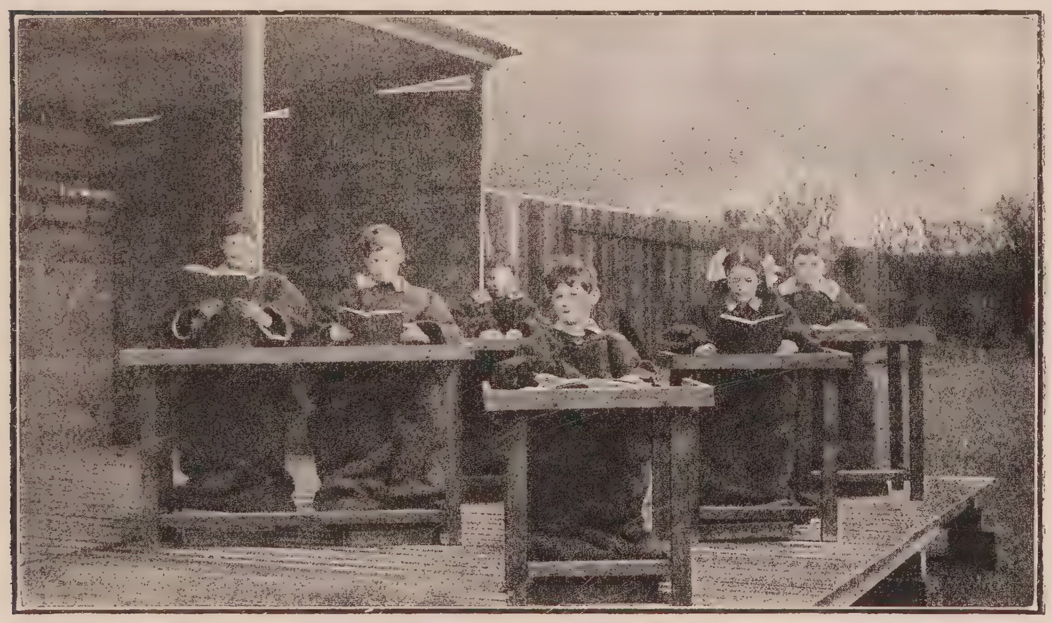

Fig. 21.—The Open-air School, Broadlands, Medstead, Hants. The children are wearing sack ulsters in the bottom of each of which is a hot-water bottle.

The house schoolrooms, where preparation is done and the girls sit in the evenings, should be as homelike as possible. Tables at which the girls can sit comfortably should be used, and not desks. The most convenient arrangement for writing is a sloping board with adjustable back. The height of the table, of course, must be considered. I have found a board with a hinged cross-support behind quite effective; it takes up little room in the girl's locker or shelf, and can be made by anyone. The support is 4 or 5 inches high, the cross-piece 2 inches thick; hence when the hinge is turned down, you can get a slope from 2 inches only.

The older girls should have their own study tables, and be encouraged to keep them nice. Small tables about 3 feet long and 18 inches wide, with a shelf at the back for books and ornaments, are practical, and much appreciated. Every girl should have her own cupboard-space in the schoolroom for books and needlework. Some comfortable chairs, and an old-fashioned schoolroom sofa or backboard, add materially to the wellbeing of back-aching children; and if your school is alert and keen, you need not be afraid of unwholesome lounging.

The dining-room or kitchen in a big public day-school is apt to be dull. Flowers and clean tablecloths are not serious items, nor do they mean great expense, and we want to train our girls to keep comfortable homes. Clean American cloth, which is much used in France, is a great deal better than dirty, crumpled tablecloths, where the expense of washing is a very important consideration. I have known a school where no effort was made to train the girls in these respects: they spilt constantly, and the tables were not fit to sit at. The meals were badly cooked and served. The whole effect was demoralizing: the girls ate little and grumbled much. A new régime was established: no more money was spent, but a certain amount of trouble taken, with the result that eating increased and grumbling lessened. The more cheerful talk and laughter at meals, the better. A girl who comes from her work too tired to laugh is too tired to eat, and much too tired to digest what she does eat; and cheerful, well-lighted rooms have more to do with talk and laughter than is always recognized.

Dormitories.—I have already explained why I advocate putting girls of different ages together. Very various sleeping arrangements are adopted in equally good schools. Some have three or four girls in a bedroom, with movable screens to ensure privacy when desired: cheap screens can be made of Holland or Turkey twill on ordinary clothes-horses. This plan may also be adopted in schools where there are long, open dormitories, if cubicles are quite impossible. In other schools each girl has what is practically her own bedroom with wooden partition walls: the objections to this arrangement are, that unless each cubicle has a window it is apt to be stuffy, and the wooden walls cut off light and sunshine. The best arrangement is to give each girl her part of the room, curtained off by curtains of some light but non-transparent washing material (chintz or Turkey red, or casement cloth, answer the purpose well). This curtain should be slung from wood or iron bars supported from the walls, and about 7 feet from the ground. When the girls are not actually dressing or undressing these curtains should be drawn aside to leave the whole space open. A responsible girl should be given charge of each dormitory, and its management left in her hands: if punctuality is insisted on, and there is a silence rule, which will allow some quiet time before getting into bed, no further rules should be needed. I think on the whole it is better not to allow girls to go to one another's dormitory without leave. This lessens the risk of infection, and I have found in practice that a desirable friendship may be fostered, or an undesirable one broken, without any discussion on the matter, by putting the right girls to sleep together.

The cubicle furniture should be as simple as is consistent with comfort—a chest of drawers with a looking-glass on it, a small tiled wash-hand stand, bed and chair. When drawers are too expensive, lockers can be well and cheaply made by packing-cases stained and varnished green or brown, with a curtain in front. The important thing is that each girl should have *a place of her own* for her possessions. No clothes except dressing-gowns should hang in the dormitories; hanging cupboards with curtains collect dust. Coats and skirts should be hung in big cupboards or wardrobes outside. Simple enamelled bedsteads, with *good* mattresses, not too soft, are best; if cheap spring beds are used, they are apt to develop a hole in the middle, and this is bad for a young girl, preventing freedom of movement, besides being uncomfortable. The girls should strip their beds directly they rise, and all cubicle curtains, etc., be drawn before they leave the room. As a person gives off on an average a pound of perspiration in twenty-four hours, and this is mixed with organic and oily matter, the reasons for through airing of bed-clothes and night-gown is obvious.

For the same reason, clothes should not be folded at night, but hung over the chair.

Every girl should be provided, or should provide herself, with a square flannel bag into which to put her feet in cold weather. This is better than a hot-water bottle, unless a girl has very bad circulation.

Bath-rooms are always a problem in a boarding-school. One for ten girls is a very fair allowance where taps run quickly, as it allows every girl to have a daily bath. In connection with the bath-rooms there should be hot-air cupboards for drying and airing clothes.

The water-closets should be, if possible, at the end of a passage, with ample window space and ventilation, never crowded into a corner in the main building. It is desirable to have completely separate apartments, but where ventilation is a real difficulty the undesirable expedient of having partition walls reaching only part of the way may be resorted to. Simple wash-down closets are now always used, and a special point must be made of sufficient water-supply. Constant inspection is necessary to see that the chains pull easily, the water runs quickly, and that there is no unpleasant odour: girls will not say when things are wrong in this respect. Generally speaking, one closet should be allowed for every six girls in the boarding-house, and for every ten in the school.

Downstairs lavatories for hand-washing in the day-time are a great convenience. They should be fitted with hot and cold water, and one basin for every twenty girls should suffice. The roller-towels should be constantly changed, or they may become a source of infection, and should be dried at night.

The sick-room should be in a quiet part of the house; where possible, it is convenient to have bath-room and closet close at hand, as well as a housemaid's pantry with gas ring. Here any warming of food or washing-up can be done. It is convenient to have the matron's room communicating, or a small dressing-room attached. All dreariness must be avoided, the walls distempered white or pale green; and a south window, and balcony or verandah into which the bed or couch can be wheeled, are very valuable assets. A tessellated concrete floor, with a warm rug, is easily kept clean; rounded corners prevent the accumulation of dust. The less furniture the better: what there is should be enamelled white to allow of washing; glass tops to tables and lockers are bright and clean. Bright washing curtains and bed-spread will make the room less dull and bare.

Boot and cloak rooms.—Boots should be taken off and left in the boot-room downstairs. In all schools every girl should have her peg and boot-box in the cloak-room, and changing be insisted upon in wet weather. Damp, cold feet have much to do with the constant colds among elementary school children. I know how hard poverty presses, and of course teachers must use their discretion in this as in other matters; but ignorance and carelessness are often far more to blame for neglect of such simple precautions than poverty *per se.*

Parquet floors are desirable in school, as noise is obviated. A noisy atmosphere means disorder, and for this reason girls should wear rubber or no heels in the house.

Light.—A school should be flooded with light. In this country we cannot get too much. The headmistress of a well-known school tells me she believes in it in abundance, as making all the difference to her girls, though she has no scientific ground for her opinion! In one school I went to, the first thing that struck me was the happiness and laughter; it was a distinctive feature of the place. At the time I commented on it, but it was only on returning there, after seeing many other schools, that I noticed the unusually great proportion of window space and the general effect of sunshine. Cellars are excellent as foundations, but not to live in. Plants grown in a poor light turn white, their colouring matter cannot develop, and in exactly the same way the hæmoglobins or red colouring matter in the blood only develops in sunshine.

Some years ago an asylum for blind children was built with little regard to good lighting—"the children, poor little things, would be none the wiser." They were not, but they grew anæmic and listless, and the only way the authorities could improve the health was by letting in more sunshine. If all green plants refuse to flourish in a room, you may be sure girls will not do so.

The best light is that which comes from high up, so windows should reach well up towards the ceiling. As a general rule light should come from the left-hand side, never from behind or in the front. Girls are often extraordinarily stupid in this respect, and want constant reminding. Where electric light is used it should be carefully shaded: green shades are best, and it is convenient to have a pulley arrangement by which the light can be adjusted, so that the shade is about on a level with the writer's eye.

Where it is not possible for every girl to have the best light at once, places should be changed after a certain time. In my present laboratory the light all comes from one side, and as the girls sit at tables facing one another, one set always draw with their hand's shadow in the way; by changing places between classes, the bad results of the arrangement are minimized. I have seen girls forced to work by unshaded paraffin lamps which hardly gave enough light to read by, so that the eyes were continuously strained. Such a condition of things is scandalous, for no knowledge gained would compensate for the resultant headache and damaged eyesight. Blackboards should be dull, not shiny, and placed so that the light does not fall full upon them.

In conclusion, whatever the light used—

1. Avoid glare.
2. Have enough to see by.
3. Be sure it is steady: a flickering light involves too constant readjustment of the iris muscle controlling the amount of light entering the eye. Hence the harm of reading by firelight or a flickering candle.

Ventilation.—The great importance of fresh air from the point of view of healthful activity has already been dwelt on in this book, and no room air can compare with the open. In our hospitals, patients who do not thrive in the bright, airy wards are put out on balconies, and begin to improve. All schoolgirls are too apt to live *in*doors. A great deal of the present keeping children indoors is nothing more or less than prejudice. People have a vague idea that being out of doors means "playing." Doubtless the open-air schools will gradually dispel this fallacy; meanwhile, wherever possible, schools should be built with a certain number of open class-rooms on the sheltered side. All class-rooms on the ground floor should have doors opening directly on to asphalted pavements, so that the children can come in and out in fine weather between classes and during classes.

The air indoors must be *pure, sufficiently warm, moist.*

As has just been pointed out, purity in the ideal sense we cannot have in our houses, but we *can* so arrange that there is a sufficient quantity of air; at least 3000 cubic feet space per person should be allowed, but, as we all know, this is impracticable in most cases. The children in many hospitals live on the sheltered balconies, hail, rain, or snow.

Atmospheric air consists of	Oxygen	20·96.
,, ,, ,,	Nitrogen	79.
,, ,, ,,	Carbon dioxide	·04.

Now all combustion or burning means combination with oxygen, and in any room, people, gas burners, and fires are constantly using up the oxygen in the atmosphere, and giving out in its place carbon dioxide. We have therefore so to arrange our rooms that there may be a continuous passage in of fresh atmospheric air, and an outlet for that which has been vitiated.

The peculiar harmfulness of breathed-out air lies not only in the fact that in it the carbon dioxide has taken the place of oxygen, but that it is laden with organic impurities; it is thanks to these that we find a badly ventilated room warm and "stuffy." The harmful effects of such a room on children can hardly be overestimated. Girls are literally *poisoned* by it, and the drowsiness and inattentiveness that ensue where half an hour is spent under such conditions will give place in time to dullness and deficient vitality, if the stuffiness is not remedied, but is of everyday occurrence.

In all systems of ventilation advantage is taken of the fact that warm air is lighter than cold, so rises above it. As the air in a room is generally warmer than that outside, we can easily arrange for one to replace the other: we must, of course, distinguish between outlets and inlets—the latter being placed high up, the former lower down.

Where open fires are in use, much of the used air is drawn up the chimney, and if the window be left slightly open at the top cold air will be drawn into the room to take its place. I have found in practice that window ventilation is the most satisfactory, but teachers should remember that children vary greatly in their sensitiveness to draught, and a girl ought not to be obliged to sit under an open window if she complains of cold: all draught can be avoided by raising the lower sash about three inches and inserting a piece of boarding which fits the opening. The fresh air then passes into the room by the passage between the two sashes. Of course the inlet in this case is very limited, and will only serve when floor space is ample—*i.e.*, where there are not too many in the room.

Inlet ventilators in common use are Tobin's shafts and Sheringham valves, or a brick pierced with holes is occasionally used. Such ventilators serve their purpose well when they are not allowed to degenerate into dust traps!

To open door and window is the quickest way of ventilating a room. I know of a certain school which prides itself on its freedom from epidemics, and its method of fighting the microbes includes the regular opening of doors and windows for five minutes between classes.

Girls cannot have too much air at night, but in this as in all else common sense is necessary. I have heard many complaints of the suffering caused by stony-hearted teachers and nurses who open windows wide, regardless of the shivers of the less thick-skinned mortals. As a general rule it may be laid down that draught which strikes cold is hurtful; it may give rise to neuralgia, and chill always lowers a child's power of resistance to infection: either the girls must put on more clothes or a better method of ventilation be invented.

Heating.—The system of heating in school or boarding-house will depend partly on size, partly on expense. Rooms should be kept at a temperature of from 55° to 60° F. (rather more for little children), and this temperature *must not be maintained by cutting off ventilation.* There should be a thermometer in every room, as personal sensations with regard to temperature are quite unreliable.

Fires.—The *drawbacks* to fires are—

1. The additional labour involved in keeping them up.

2. The dust and smoke carried into the room by back draught.

3. The impossibility of getting a uniform temperature in any but very small rooms.

4. Expense, in that it is difficult to regulate the supply of fuel.

The *advantages* are no small ones, *i.e.*—

1. A fire supplies some of the brightness which children so badly need in cold, dull winter weather.

2. The fireplace is an important source of ventilation. As the air in its vicinity is warmed it is drawn up the chimney, so fresh air passes in through the inlet. Where the inlet is not sufficient, however, cold air may be drawn in under the doors and so give cold feet.

Fireplaces should always be put in the centre of an inner wall, so that as little heat as possible is lost. For the same reason there should be little metal-work, and the grate should be built well forward. Metal is a good conductor, and heat passes through it into the wall instead of being radiated into the room.

In open fires heat is diffused by radiation only from the exposed red surface; from this it follows, that the principal things to aim at are exposure of as much lighted surface as possible with the least expenditure of fuel, and as little conduction of heat into the wall or up the chimney, with as many heat rays as possible reflected into the room from the back of the chimney.

Stoves.—Closed stoves are frequently used now for large buildings; fuel is introduced above, and the air required for combustion enters by an aperture which can be regulated in size. Hence when little heat is required there is only a small aperture for air. It is essential to have a pipe to carry off the products of combustion, and this should be of wrought-iron.

The *objections* to stoves are—

1. The air itself is warmed and dried by coming into contact with the hot surface. This may cause skin and throat irritations, and is best obviated by always keeping an open vessel of water on the stove, which, as it evaporates, will supply the atmosphere with the needful water-vapour.

2. Little air is drawn into a stove, so it is of proportionately little use as a ventilating agent.

3. As the supply of oxygen is limited, carbon monoxide (a very poisonous gas) is largely found, and should the chimney for carrying off the products of combustion be defective it may escape into the room. Hence the extreme importance of wrought-iron exits for such gases.

4. Stoves look dull.

Closed stoves are *advantageous* in that—

1. They are very clean.

2. The heat which they give can be regulated.

3. Little labour is expended in attending to them.

4. The fuel supply can be so controlled that there is no waste.

Hot-water heating.—For school buildings hot-water heating seems to have come to stay. A boiler is placed low down in the building, both pipes and boiler are kept full of water, and when a fire is lit, the hot water rises up the pipe leading up from the boiler, and is carried through the rooms to the top of the building. By this time it has lost much of its heat, and it now passes down and back into the boiler. By doubling and redoubling the pipes, and employing radiators, you can increase the heating surface in any part of the building.

The objections to hot-water heating are—

1. It makes any regulation of heat in the several rooms impossible. Where there is too small a surface of piping, the rooms may be bitterly cold; where too much, they may be very much too warm.

2. It is very costly to put in.

3. The furnace must be constantly attended to in the winter, or the water in the pipes may freeze, and in so doing expand and burst the pipes.

The principal advantage lies in the saving of labour as there is only one furnace to be stoked.

Steam-heating is little employed in schools.

In the *hot-air system* air is passed over the pipes in the furnace-room before being admitted to the building.

Gas is not likely to be used as a heating agent in schools owing to its great expense. The principal *drawback* apart from this is—

Gas-heating may give rise to harmful products of combustion; in any case, as Dr. Wakefield[1] points out, an ordinary gas burner will add as much carbon dioxide to the air as the breathing of three men, hence unless there is very careful provision made for the getting rid of the products of combustion, they make a room unwholesome.

The advantages are—

It is clean:

It is under perfect control, and in so far as this is the case, economical.

Electric heating is at present too much on trial to be dealt with here.

Whatever method of heating is adopted we must not let the children suffer from cold; the aim to be attained is *ventilation and a comfortable temperature*, never one at the expense of the other.

Pure air, light, sunshine, space, warmth, and quiet. These are not the best gifts, but they are all good, and it is for us to see that we do not by our ignorance, or greed, or carelessness in building, deprive our children of their heritage.

[1] *Hygiene and Physiology.*

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REFERENCES.

The following lists may be useful for those who want further information on the subjects touched on in this book. They are in no way exhaustive!

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The following Societies all deal with the subjects touched on in this book :—

FROEBEL SOCIETY OF GREAT BRITAIN AND IRELAND, 4 Bloomsbury Square, London, W.C.
PARENTS' NATIONAL EDUCATIONAL UNION, 36 Victoria Street, London, S.W.
THE CHILD STUDY SOCIETY OF LONDON, 90 Buckingham Palace Road, S.W.
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